THIRTEENTH ANNUAL REPORT

OF THE

AMERICAN DAIRYMEN'S ASSOCIATION,

WITH

TRANSACTIONS AND ADDRESSES,

FOR THE YEAR ENDING

JANUARY 10TH, 1878.

New York:
PRINTED AT OFFICE OF "THE AMERICAN DAIRYMAN,"
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1878.

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OF THE

THIRTEENTH ANNUAL REPORT

OF

The American Dairymen's Association.

PREFATORY REMARKS.

The undersigned herewith offers to the members of the American Dairymen's Association the 13th Annual Report of its Secretary for the year ending January 10th, 1878, with his congratulations to the dairymen of the country for the prosperous year they have just enjoyed, and for the hopeful prospects of prosperty in the season now opening. While almost every other industry has been languishing or depressed, the labors of the dairyman have been rewarded with more than their usual compensation. It is believed that never, since our interest has assumed any considerable importance, have its products brought the producer so large a return, when measured by a specie value, as during the year just closed, nor has the aggregate of products ever been so large or so fine. The industry has now reached such vast proportions in the commerce of the country as to make a marked effect upon the wealth of the nation, as well as upon the individual producer.

The success attained should only encourage and stimulate to further improvements. While our goods are yet confessedly a great way below their highest possibilities, it is gratifying to note the increasing efforts at reform. More is now being written and published upon the dairy than ever before. Associations—the great master-wheel of dairy improvement—are being newly formed every year, and sending out new reports, which are read and studied. The reports of our association have never been so largely called for as at the present time. Two thousand copies—which is more than double the usual number—have been ordered, and nearly all of them called for before they could be printed.

An important addition to our dairy literature has been made the past year by the publication of the AMERICAN DAIRYMAN, a weekly journal devoted exclusively to the interests of the dairy—a much needed publication—which, it is hoped, will prosper and be the means of much good. In the agricultural schools of Connecticut and Ontario departments for experiments with reference to improvements in the dairy have been initiated, and a bill for a similar purpose is now before the Legislature of New York. Science and skill are constantly being more and more called into requisition, and genius is all the time busy in turning out new inventions for facilitating and improving the work to be accomplished.

With the hope that this little annual volume, which contains the papers and discussions of our late convention, may not be found behind its predecessors in contributing its accustomed quota toward pushing on the spirit of reform, which seems now to be so fairly aroused, it is very respectfully submitted.

L. B. ARNOLD, *Secretary.*

ROCHESTER, N. Y., March 11th, 1878.

ARTICLES OF ASSOCIATION.

WHEREAS, It is deemed expedient to merge the New York State Cheese Manufacturers Association, which was organized in January, 1864, into an American' Association, through which, as a medium, results of the practical experience of dairymen may be gathered and disseminated to the dairying community; therefore,

Resolved, That we, the undersigned, do hereby associate ourselves together for mutual improvement in the science of cheese-making, and more efficient action in promoting the general interest of the dairy community.

ARTICLE I. The name of the organization shall be The American Dairymen's Association.

ART. II. The Officers of the Association shall consist of a President, Vice-President, Secretary and Treasurer.

ART. III. The President, First Vice-President, Secretary and Treasurer, shall constitute the Executive Board of the Association.

ART. IV. The Officers of the Association shall be elected at the regular annual meeting, and shall retain their offices until their successors are chosen.

ART. V. The regular annual meeting shall occur on the second Tuesday in January of each year, and at such place as the Executive Board shall designate.

ART. VI. The payment of one dollar shall admit any person to all the sessions of an Annual Meeting—and the additional payment of seventy-five cents shall entitle him to the Annual Report for the current year.

AMENDMENT.—The Secretary is hereby empowered to appoint an Assistant Secretary to assist during the sittings of the Convention, and discharge such other duties as may be assigned to him, and, in case of the absence or inability of the Secretary to act, to temporarily discharge the duties of that office; it being distinctly understood that no compensation is attached thereon.

[One dollar constitutes a person not attending an Annual Convention a member of the Society for one year, and entitles him to the Annual Report.]

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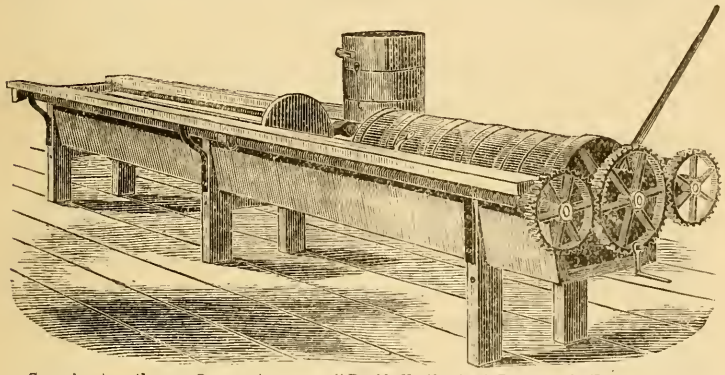

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TRANSACTIONS

OF THE

THIRTEENTH ANNUAL CONVENTION

OF

The American Dairymen's Association,

HELD IN CASE HALL, CLEVELAND, O.,

TUESDAY, WEDNESDAY AND THURSDAY,

January 8th, 9th, and 10th., 1878.

The convention met at the appointed hour, and was joined by the Ohio State and Western Reserve Dairy Associations. Secretary Arnold called the meeting to order, and invited T. D. Curtis, of New York, Vice-President of the American Association, to the chair. Upon taking the chair, Mr. Curtis said :

Gentlemen of the Combined Associations : I congratulate you for the favorable circumstances under which you meet in this beautiful hall, which is much superior to the quarters in which our previous meetings have been held. To some of you the number in attendance may seem small, but I can assure you it is as large as usual at the opening session. What is the pleasure of the convention?

On the motion of S. A. Farrington, of Pa., the appointment of the usual committees was voted, and the following Committee on Order of Business announced : S. E. Carter, C. B. Chamberlain, H. B. Clark, W. A. Johnson, J. B. Lewis.

The appointment of the other Committees was deferred till next day.

The Chairman then remarked that the balance of the time of this session might be occupied with short addresses or conversational exercises in connection with the dairy business, and would be glad to hear from any one who might have anything to offer, or a question to ask.

Mr. Chamberlain being called upon, said : In former times we made cheese very differently from what we do at the present day. We then thought there could be no cream taken from the milk ; but the experience of late years has taught us that a certain proportion of the cream

may be taken away and still a cheese made, that has closer and better keeping qualities than those made from whole milk. I recollect distinctly when the Ohio Dairymen's Association was organized, some eight or ten years ago, how my friend, Mr. Horr, contended stoutly for whole-milk cheese. We have, however, experimented until we have found that when two to two and a half pounds of butter are taken from one hundred pounds of milk, a closer made and better keeping quality of cheese can be made. Some, perhaps, would take more than this. We get our milk but once a day, as our patrons think there is no other way superior to once a day delivery. We do not manufacture the new milk with the old, but think it is far better to manufacture the morning's milk by itself; and by taking the cream from the night's milk, we think we can make a cheese that will bear the weather and stand transportation better than if we put both milkings together and left all the cream in.

Mr. Chas. Horr, being called for, said: It seems to me to be a very loose statement to say that we can take from two to two and a half pounds per hundred. You cannot take the same quantity of butter from milk the year round. You may take in November three times as much as you can in July or August, and if you should take two and a half pounds in May, your cheese would not be worth six cents a pound. It is not best to teach very dogmatically on this subject. If the cream is taken away at all, it must be done with good judgment. He who manufactures this kind of cheese must have all the appliances for handling the milk, &c.; he must know all that relates to the price of both butter and cheese—the demand and supply, &c. This matter of skimmed milk cheese must be left, it seems to me, to the good judgment of each factory. You cannot give a rule for this as you can for making a batch of cakes. You have got to learn by experience how much butter can be made from a given amount of milk in each month of the year. In dropping this subject, I would make a few remarks on farming. My attention has been called to this subject from my recent visit to Europe, and witnessing the improved methods of farming there. We have followed our fathers in their habits of farming when land was very cheap. They could keep a certain number of cows on 50 or 100 acres, and if they wished to keep more they would buy another hundred acres, at $10 to $15 per acre, and we have tried to do the same, when land has increased to $50 and $60 per acre, instead of improving what we had and increasing its productive powers by draining, manuring, etc. We are always ready in our conventions to give and take hints on the manufacture of cheese and butter, while the discussion of better ways to improve our farms and increase their fertility, &c., is almost entirely neglected.

Mr. Carter:—I agree with Mr. Horr. I ought to have qualified my remarks by stating that different seasons of the year require less skimming. We may take four pounds in the Fall with as much safety as we can one in the Spring. I also agree with what he has said in rela-

tion to farming. We, as farmers, are very dilatory in adopting ways and means for keeping up the fertility of the soil.

Prof. Arnold :—With regard to skimming, I would ask Mr. Horr if he has determined how small an amount of butter may be left in the cheese and still make a fine palatable article. This is a very important matter to know just how much must remain in the cheese to secure fair results.

Mr. Horr :— To unravel that difficulty I have spent four years experimenting and have found the true answer for myself, but not for this Convention.

Mr. W. B. Straight :—The impression has gone forth that we make skimmed milk cheese. We claim that we do not. We try to make a fine article of cheese by leaving enough cream in the milk. We use what we call stock factories—generally skimming the night's milk only. Those who are in the business know well enough that there is a portion of cream that is not worked in but runs off in the whey and is lost. We endeavor to save this loss. We have the fact before us. Cheese made in this way goes off as the very best class in the trade. We make them so that they will handle safely in hot weather, working them down closely. We have tried the experiment of skimming both messes, but find it will not do, except in cold weather. We take in the milk in the evening, cool it down till nine or ten o'clock, then set in large vats, and skim about four o'clock in the morning. When the morning's milk comes, mix all together. In this way we take one pound of butter from 60 to 70 pounds of milk. I think it will be granted that this is very light skimming. Our vats have no cream on the side. We have had our cheese tried by the side of whole-milk cheese, made night and morning, and no one is prepared to say that our cheese is not as good. Others skim more, make a poor article and suffer loss. Only very late in the Fall we take from both messes. The trouble is, in going to an excess in this matter. The great aim of us all, as business men, is to make all we can out of our milk.

Member: Do you keep your vats covered?

Ans. We do.

Prof. Arnold : In reference to Mr. Horr's answer, permit me to remark that the Executive Board of the American Dairymen's Association has accepted your invitation to come here to unite with you in the discussion of questions for the mutual benefit of the people of Ohio, and all others concerned. Now, I submit, whether it is fair toward us who have come here at a great sacrifice of time and labor and money, t be told at the outset by those who are able to do it, that they will neither enlighten their brother dairymen of Ohio nor us, but that they will keep their knowledge as stock in trade, and gather, meanwhile, what they may from the rest of the Convention. Is the policy sound? Would it be a benefit or an injury if everybody in Ohio would make as good butter as Mr. Horr does?

If all the goods in Ohio could be brought up to his standard, would it not create a rise in price and an increased demand for such goods, similar to that of Herkimer County cheese, and, therefore, would it not be better to instruct everybody as far as possible how to make a good article, and as much as possible, out of his milk

Mr. HORR: There are very good reasons why I should not encourage others to attempt the manufacture of cheese on the plan referred to by telling them how much cream I find it necessary to leave in the milk, unless I am certain that they possess all the necessary appliances, as well as the skill required in its manipulation. For if he should attempt it without the thorough understanding of the system, the influences of rennet, heat, salt, &c., he will certainly have many cheese good for nothing.

The Chairman, Mr. CURTIS: The point we want to reach is what percentage of cream you must leave in the milk in order to make a cheese that is digestible. Having estimated that point, I would say that twelve per cent. of the cream must be in the milk in order to make a digestible, wholesome cheese.

Prof. ARNOLD being called upon to give his opinion said: I see Dr. Mott, from New York, who is a practical chemist, and I would ask him what percentage of butter is necessary to make a digestible cheese.

Dr. MOTT: I feel some hesitancy in offering an opinion on this subject, as I have not made analyses to ascertain. It is a fact that milk varies greatly in its composition. It would appear to me that the subject requires more investigation.

Mr. WIRE, Ashtabula: Having had considerable experience in skimming milk for the last eight or nine years, I would say that we are well pleased with the results, although ours is perhaps the poorest dairy county that could be found anywhere. The land poor and swampy, the cattle compelled to drink from miserable stagnant pools. The cows generally come out in the Spring, in a very poor and weak condition, and consequently the milk is of inferior quality. We generally begin about the first of April, and skim the night's milk. Our patrons bring their milk once a day till about the 15th of September, when they begin to bring it every second day, and, as the weather gets cooler, once in three days, and finally, in December, every fourth day. We could not induce our patrons to go back to twice a day carrying.

Prof. ARNOLD : I am satisfied with Mr. HORR's answer. There is no fixed standard that I know of by which we can skim and make a fair cheese. I have made a few observations on this point, and I do not think we can go below eight or ten per cent. of fat in the cheese. We have made some very good cheese with only twelve per cent. of fat, but they are cured with great difficulty, as they are either too dry, with a tendency to sour, or else, if there is water enough in it, it will puff and swell up, become rank, and will soon rot if it is not eaten up to save it

from rotting. By using a great deal of skill, you may, with ten per cent. of fat, have sufficient to get up the cheesy fermentation that should take place.

Ques. By a member—Will Prof. ARNOLD please tell us his method of making and salting, &c., with ten per cent. of fat?

Ans. The process begins with scalding the milk, the first object of which is to preserve its keeping qualities, and the second is to get rid of foreign odors. The increased heat drives these all out, and you get a sound, sweet milk, almost entirely free from any putrefactive ferments. Then the cheesy matter becomes soft by heating the milk. The reason why the cheese of Herkimer County is usually better than that made in other localities is because of its superior grass, which continues green and and fresh, makes the cheesy matter in the milk soft, and the cheese cures readily. It don't require half the skill to make cheese in Herkimer County that it does in Michigan, where the cheesy matter is harder. Another effect of scalding the milk is, it takes away the peculiar flavor of buttermilk and prevents it from affecting the cheese.

Ques. To what degree of heat do you scald?

Ans. To 130° and above.

Ques. Suppose you reduce it to 50°, what would be the effect?

Ans. The odor would remain.

Ques. Is cheese made by this process possessed of good keeping qualities.

Ans. Yes. If you want either butter or cheese to keep you must have the foreign ferments out of them. I do not consider it objectionable to salt it pretty high. It requires a certain amount of salt to facilitate the action of the rennet. Just how the salt acts upon the rennet I don't claim to know.

Ques. How long do you set before cutting?

Ans. Twenty minutes. My preference is to apply rennet to the milk at 98° to 100°. When we are making skimmed milk cheese we require a larger amount of rennet than we do in making whole milk cheese. So I put in all the rennet that we can manage, provided it is sweet, so as to induce the cheesing process.

Ques. How heavy do you salt it?

Ans. This will vary according to the dryness of the curd. If the curd is very wet, it would require as much as three pounds of salt to the hundred pounds of curd. I prefer to salt by the number of pounds of curd, because the curd does not always correspond with the quantity of milk

Ques. If you heat up to 120° or 130°, would you not lose the cream?

Ans. No.

Ques. What quantity of cream or butter do you take from the milk?

Ans. If 100 pounds of milk contains 5 pounds of butter, we can take one pound of butter from 25 to 28 pounds of milk.

I arose, in the first place, to state a little circumstance that I heard of

the other day. It occurred in a factory where they carry milk once a day. A gentleman sent me a letter, stating that by cooling the milk in large pans, reducing the temperature down to 60°, so that it would undergo very little change, it was found that milk thus cooled and skimmed, produced more cheese than whole milk did, and even better in quality.

Adjourned until two P. M.

Afternoon Session.

At two o'clock, Mr. Canon called the Convention to order and introduced Mr. Eastburn Reader, of New Hope, Pa., who addressed the Convention on oleomargarine *vs.* butter. Mr. Reader spoke as follows:

INTRODUCTORY.

As the earth, in its allotted sphere, pursues its ceaseless march through the regions of boundless space, so does the inventive genius of man, its highest occupant and possessor, keep pace through the centuries of endless time in making provision for his sustenance and comfort. From the time when the good old Jewish patriarch Abraham, and his beautiful wife Sarah, entertained their angelic visitors, he, taking "butter and milk, and the calf which he had dressed," and she, "making ready quickly three measures of fine meal," set before them the cakes which her own hands had wrought and "baked upon the hearth," a period of time nineteen centuries before the advent of Christianity, down until the beginning of the eighth decade of this, the 19th century, in which we live, the dairyman, whose particular branch of the avocation is the manufacturing and selling of a prime article of butter, has had no competition or rivalry from outside the ranks of his own profession.

The Executive Committee of the Pennsylvania State Board of Agriculture, since the meeting of the Board in May last, have drafted two bills, one entitled "An act to prevent deception in the sale of butter," and the other, "An act to regulate the manufacture and sale of fertilizers." Copies of these bills have been sent to all the members of the Board, with directions from the Secretary to submit them for examination and discussion to all associations of agriculturists in their respective districts, that they may be endorsed by them, or otherwise, before the convening of the next session of our State Legislature.

THE PHILADELPHIA PROCESS.

In obedience to these instructions, I submitted copies of these proposed laws to the Salsbury Farmers' Club, of which I have the honor of being a member, at their regular monthly session in September. Pending the discussion of the Oleomargarine bill, it was deemed important by the members to have a sample of the production for examination before coming to a conclusion in regard to approving or rejecting the bill. I went to Philadelphia to get a sample of oleomargarine, and found con-

siderable difficulty in finding it. The butter dealers generally, in response to my queries, appeared to know but very little about it; the most of them had heard of it, but very few had ever seen it, and not a man of them had ever kept it for sale. "It would be death to their trade for them to keep it for sale." At length I found a grocer who recollected having read an article in one of the daily papers, describing the process of manufacture, about a month previous, and he *thought* it was made at a factory in West Philadelphia, connected with the abattoir. The next morning I started early for West Philadelphia, taking a Market Street car, and getting off as soon as we crossed the Schuylkill. Passing along the west bank of the river, through the cattle pens, I soon came to the abattoir, where, after witnessing the wholesale slaughter of bullocks for a short time, I was informed that the "butter factory" was but a short distance higher up the river, or just below the Callowhill Street bridge. It is a low, white building, two stories high, and by the steam issuing from its chimney, I saw that it was a manufactory of some kind. The windows were protected by heavy wire screens, and I passed along two sides of the building before finding a door. On the third side a door was found, over which was the placard, "No admittance, except on business." Of course I had business, and walked in. In the first room I entered a man was engaged in stirring a liquid in a large tub or vat. I inquired for the superintendent, and was informed that he had just gone down to the abattoir. I told him that I had come there to see how they made butter, and to get some of it. He told me that I could not go through the factory without the consent of the superintendent, but if I wanted butter he would call the foreman. While he was gone upon this errand, I looked around a little, but saw nothing to note but a number of barrels filled with what I thought was rendered tallow. I noticed that the word "sheep" had been written with a sharp instrument of some kind on the surface of the fat contained in some of the barrels, while on others it was not. The foreman arriving, I informed him of the nature of my business and he requested me to walk to the superintendent's office. I followed, knowing he was out, but thought I might have to await his return. I requested to see a sample of the butter, which was quickly brought in a ladle, fresh from the churn. I tasted and pronounced it good. I informed the foreman that I was a farmer, living in Bucks County, Penn.; that I manufactured butter in a small way upon my farm; that I had visited several of the best dairies in Chester County, and some of the creameries in New York and other States; that I had read wonderful accounts in the papers of this manufactured butter; that I wanted to see some of it and get a sample to take home with me, that I might show it to my friends, neighbors and country dealers; that I might compare it with butter made from cream, and also test its keeping qualities. The foreman, in return, informed me that he himself had worked in a creamery for five years in

the State of Maryland, and that he had made good butter there; but he had never before produced a butter equal to this; that they were then making 5,000 pounds daily; that they were shipping it in large quantities to Europe, and that the crowned heads over there were using it daily upon their tables, &c.* While this conversation was going on the superintendent returned, when the same explanations had to be repeated. I presented a small tin box for a sample, which he directed the foreman to fill for me from the best and freshest butter. He also informed me that they did not sell the butter at retail; would not sell in less quantity than a single tub, containing from 70 to 75 pounds; that they were getting all they could for it—at the present time from 18 to 20 cents per pound. I thanked him for the sample given, put it in my pocket, and was about to depart, when he said to me he had one question to ask, viz.: "How did you get in here?" I replied that I wanted to see him and walked in; to which he responded, "That's all right," and we separated.

My next business was to hunt up the paper giving the process of manufacture, which I was fortunate enough to find without much difficulty. I now read from the Philadelphia *Record* of Aug. 4th, 1877, an article entitled, "Butter made from Beef Fat—Where the Londoners best butter is made - Thirty thousand pounds of manufactured butter sent weekly from the Philadelphia Abattoir and sold in England as prime Somerset.—*By our own reporter*," &c.

THE PHILADELPHIA FACTORY.—"HOW THE THING IS DONE THERE."

The surrounding air in the factory was free from the smells usually found in the neighborhood of grease-boiling establishments, and the floors of the various rooms were so scrupulously clean that it was difficult to imagine that a naturally unpleasant business could be so extensively carried on with such cleanly surroundings. Of late years several patents have been granted in different countries for the manufacture of butter from beef fat, but the process employed in Philadelphia, which had its origin in the inventive genius of a Frenchman named Galouis, differs from others, so it is claimed, in the fact that the manufactured butter can be preserved for a period of six months, or four times as long as that prepared by any other process. This is owing to the fact that the whole operation is carried on at a temperature not exceeding 125 degrees, the minimum of other processes being 250 degrees. The fat when received from the abattoir is first carefully assorted and the commoner portions which would not melt at 125 degrees is thrown aside. The remainder is then washed three times in as many zinc lined tubs, then conveyed by an elevator to the next floor, where it is chopped by a hasher as fine as mince meat, and then put into what are called jacketing tanks, similar to two

* In reply to the question whether sheep tallow was used in manufacturing the butter, the foreman said, "Ah, no; we use only the best fat from the fattest beeves."

cauldrons, one inside the other; the inside one having a capacity for holding 3,000 pounds. Steam is next introduced, by pipes, into the space between the inner and outer tanks, which is filled with water and heated until they are reduced to a liquid mass; this is drawn off into other tanks, through pipes and a filter, leaving a residuum behind which is sold for fertilizing purposes.

MAKING THE BUTTER.

In the second tank the same operation is gone through with as in the first, and the oil is eventually drawn off into hand trucks, lined with zinc, and holding about 200 gallons. In these it remains until it has cooled down and become hard, when it is put up in five pound bags and subjected to a hydraulic pressure of 250 tons. The oil runs from a press into a tank at its foot, again leaving a residuum, which is called "serion,"* also largely sold as a fertilizer. The refined oil is now conveyed to another room, where twenty per cent. of milk is added, and the whole is subjected to the churning process for about twenty minutes, for the purpose of giving it a flavor. It is then drawn off and allowed to get hard. After this it is laid out on tables and covered with blocks of ice. Then it is passed through a wire sieve to clear it from the milk and ice, and placed upon tables and crushed with rollers for the same purpose. The last operation completes the process, and the article is ready for market.

None of the article is sold or used in this country. As fast as manufactured, it is securely packed in tubs containing from 70 to 75 pounds, and shipped to the consignees "abroad."

This last statement should be taken with several grains of allowance. It is intended to allay the apprehensions of particular Philadelphians. I feel fully satisfied that I could have purchased a single tub for 20 cents per pound, and in large quantities for 18 cents per pound.

There are certainly two important things omitted in this published account. First—I noticed when testing the butter in the factory that it was very highly salted—I should judge at the rate of an ounce of salt to the pound of butter. Second—The butter was evidently colored to resemble June butter, and I have since learned, upon reliable authority, that from eighteen to twenty dollars worth of "Mrs. Smith's Perfected Butter Color" is sold in Philadelphia daily to this one manufactory alone. I have shown this sample of manufactured butter, in company with other samples of genuine butter, and 18 out of the 20 members present at the meeting of our club judged correctly which was the oleomargarine. Desiring to be able to show, at future meetings, which I might be called upon to attend, the exact difference, chemically, between oleomargarine and natural butter, I wrote to Professor L. B. Arnold, of

*I presume the reporter has misunderstood the pronunciation of the word; doubtless "stearine" is intended.

Rochester, New York, whom I regard as the highest dairy authority in America, for the information needed. I said that I wanted to be able to show the difference, chemically, between artificial and natural butter, and as I am not a professor, nor a chemist, but only a plain, practical farmer, who follows his plow in its furrow across the field, and milks his cow mornings and evenings, as the days come and go, why should I be expected to know the relative proportions of oleine, stearine, &c., in the two compounds? To get at this I must consult books—authorities. In reply he sent me a small pamphlet containing a "complete history and process of manufacture of artificial butter," by Henry A. Mott, Jr., mining engineer and analytical chemist, of New York City. Having now given you the method pursued in the Philadelphia factory, I will next give the plan adopted in New York, as I have been able to learn it from a perusal of this work, and where its manufacture has been carried on for a longer time, and, it may be, brought to a higher state of perfection.

The New York Process.

History.

About the year 1870 we begin to read of the application for and the granting of patents for various improvements in the processes of refining oils and fats; very modest in their pretensions at first, but growing bolder and more startling in their claims with their order of succession. The first process was patented by H. W. Bradley, Jan. 3, 1871. His specifications claim that his invention relates to a new composition for lard, butter or shortening, whereby a very cheap lard or butter is manufactured, superior to ordinary shortening, and answering the purpose of lard, butter or cream for culinary and other purposes. The product manufactured was composed of beef or mutton tallow, refined vegetable oils, and lard or stearine. This is a very modest claim. The next process proposed was patented by one Perouse, Nov. 2, 1871. His claim had the one object, "to enable the application of fine fats (especially beef fat) to alimentary and culinary purposes, and make such fat take a position *between* lard and butter, give it a good appearance, smell and taste, and also give it digestible qualities far superior to the freshest butter or lard." The product made by this patent was a mixture of beef fat, carbonate of soda, chloride of alumina and sodium, and bore no resemblance to butter. The next process patented worth considering was by Paraf, in April, 1873. The specifications and claims in this patent approach nearer to the true process for the manufacture of artificial butter. The product manufactured under Paraf's patent was called *oleomargarine* because butter was at one time considered to be a compound chiefly composed of oleine and margarine, but later investigations have shown that margarine is a mixture of palmitine and stearine. Paraf started a large Company called the Oleomargarine Manufacturing Com-

pany, in the city of New York, having for its object the manufacture of the oleomargarine, so-called.

The product manufactured by Paraf's patent resembled butter when seen at a distance, but, on examination with a microscope, was seen to have a distinct grain, which was very distinguishable on tasting; it possessed no odor or flavor of butter, and, after keeping a short time, lost its color, and acquired the odor of beef suet, from which it was made.

The next process, and it is one similar to Paraf's, was first patented in England by Mége, in 1869, and afterwards in this country, in 1873, and finally re-issued May 12, 1874. This re-issue contains all the valuable points in both the English and American patents, and is now the property of the United States Dairy Company. These patents cover two principal operations in the manufacturing of butter from the fat of animals, viz.: First, the extraction of the oil at a low temperature; and second, the converting of the oil, by churning with milk, into butter.

Prof. Mott was employed by the United States Dairy Company to make a series of experiments for the perfecting of the artificial product at their factory in Brooklyn, during a period of several months. He became satisfied that good butter could only be made by the use of the oil rendered at a very low temperature—below 125° F. Whenever made at a higher temperature the oil, or the butter made from it, would smell like tallow after standing a few days, which smell would be sufficient to repel any butter buyer from purchasing it. This smell is occasioned by using oil rendered at a temperature above 125°, being tainted by the decomposition of the animal membranes. In conducting his experiments his object was to make a product containing no element *foreign* to the very best of butter. His first discovery was a process by which he was enabled completely to remove the grain from the artificial product of butter. This process is described in his true process of making artificial butter. How to introduce into this product the true odor and flavor of butter, without injuring its texture, was a problem of considerable difficulty, but after working at it for three months, it was finally discovered.

Another patent is yet to be considered—that of Garret Cosine, dated February 15, 1876, for improvement in processes for making artificial butter. The object of this patent is to make *two* products, one for Winter and the other for Summer use. The Winter product consists of oleine and *fruit*, or *nut-oil*, flavored with milk and salt. The Summer product is similar to that made by Paraf, and not saleable in market. This patent of Cosine is the most startling yet out, for even the nutty flavor of Jersey butter is attempted. With respect to the temperature stated by Brande for the melting point of fat being 100° F., Prof. Mott found that he must evidently refer to fat freed from its membrane, as the fat cannot be practically separated from its membrane under a temperature of 109° F., and then only in very exceptional cases.

MOTT'S PROCESS FOR MAKING ARTIFICIAL BUTTER.

As in the manufacture of natural butter, when a good product is to be obtained, the first and most important principle to be observed is entire cleanliness.

First, the Washing Process.—The fat, on arriving at the factory, is first weighed, and then thrown into large tanks containing tepid water, care being taken to place all pieces that are dirty or bloody in a separate tank to be washed. The fat in the tanks should be covered with tepid water and soaked for an hour, when the water is drawn off and the fat thoroughly washed in cold water; then covered again with fresh cold water and allowed to stand an hour longer; the water is then again removed, and the fat thoroughly washed for the last time with fresh cold water, when it is ready for the next operation, which is

Second, the Disintegrating or Chopping Process.—This is done by passing it through a meat hasher or chopper, where it is cut by means of revolving knives very fine, and forced through a fine sieve out of the machine into a tub.

Third, the Melting Process.—The fat is next removed to the melting tank, care being taken to drain off all the water remaining It is heated by means of water surrounding the tank, until the temperature reaches 116°. when the steam which heats the water is turned off. The water surrounding the tank being much warmer than the melted fat, increases its temperature to about 122° to 124°, when the fat is completely melted. During the whole operation of melting, the fat must be constantly stirred to maintain an even temperature. The adipose membrane, called scrap, settles to the bottom, and a clear yellow oil floats on top. The melting process, when conducted rightly, takes two or three hours. The oil should then stand at least 24 or 36 hours to granulate, and the temperature of the room should be 80°. This is a very important operation, and must not be hurried, otherwise the *stearine* in the oil will not have time to crystalize.

Fourth, the Pressing Process.—The refined fat is now removed to the press room, which should be of a temperature between eighty and ninety degress. It must not be so solid that it cannot be easily worked with the fingers. It is next packed in cloths set in moulds, to form packages four inches wide, 8 inches long, and 1½ inches thick. These packages are then placed upon galvanized iron plates in the press at equal distances apart, and piled one above another until the press is filled. They are first subjected to a slight pressure, which is increased gradually until the oil begins to flow slowly. The oil is received in tin vessels, and the pressing is continued until no more oil can be obtained. The pressure is then removed, the plates unpacked, when cakes of pure white stearine, about 8 by 5 inches long, and one-fourth of an inch thick, appear. The stearine is now ready for

sale, while the oil obtained from the press is removed to a cool place until it reaches a temperature of 70°, when it is ready for the next operation.

The butter thus made *contains nothing foreign* to the very best of butter, and when thus prepared, it has always found a ready sale in the market, as its keeping qualities are far superior to butter made by churning milk or cream. The percentage of butyrine, caprine, caproine, &c. (essential oils of butter), that it contains is so very small (being derived from the milk in the last churning process), are not sufficient to make the butter become rancid when decomposed; but *quite* sufficient to give to the butter the so much prized flavor and odor.

[From this last statement of Prof. Mott I beg leave to dissent. His own analysis of the two compounds shows that natural butter contains 7.6 per cent. of those flavoring oils, while the artificial butter contains only .26 per cent. of them; and this small portion, which is obtained from the milk in the process of churning, has not much effect upon the taste, and cannot be expected to have. The artificial butter has been detected *at once* by nine-tenths of the persons to whom I have shown it by its tallowy taste.]

Fifth, the Churning Process.—The oil now at the proper temperature of 70°, is taken to the churning room; 100 pounds of oil are put into the churn at a time, with from 15 to 20 pounds of sour milk. About 2½ or 3 ounces of a solution of annatto, to which has been added from ½ to ¾ of an ounce of the bicarbonate of soda, must now be added, and the whole churned 12 or 15 minutes, until milk, coloring matter and oil are thoroughly mixed together, when the whole mixture is withdrawn from the churn, through a hole in one end, and allowed to fall into a tub, containing pounded ice. As the oil flows on the ice it must be kept in constant motion until the tub is filled with solidified oil. Crystalization is by this simple process completely prevented. The solidified oil, which now has an orange color, is left two or three hours in contact with the ice in the tub, when it is dumped upon an inclined table, where it is crumbled so that the ice may melt and leave the oil, which is crumbled by hand fine, and about 30 pounds at a time again introduced into the churn, with 20 or 25 pounds of churned sour milk, and churned for 15 minutes, when the solidified oil takes up a certain percentage of the milk, as also the flavor and odor, which were washed out by the ice after the first churning, and *pure butter* is produced. This is now removed to the working table, where after draining for a time, it is salted to the extent of three-quarters to one ounce of salt to the pound of butter. After proper working it is packed in firkins and is ready for sale.

Prof. Mott sent a sample of his butter made by the foregoing described process to the Hon. X. A. Willard, President of the New York State Dairymen's Association, who is considered one of the highest authorities in this country on everything connected with dairy products. Mr.

Willard says of it in reply: "The sample sent is far superior to any I have seen in flavor and texture. I have shown it to a number of experts in butter, and they were greatly surprised at its flavor. If you could produce a more waxy texture in the article, it would puzzle *some* to distinguish it from genuine butter." Mott adds: "With respect to the waxy texture—that the artificial product acquires this property on standing a short time." The sample which I exhibit has been made two months, and I leave you to be the judges of the waxy texture; also of the odor and flavor.

COST OF MANUFACTURE.

We come now to consider the cost of manufacture. Prof. Mott says a large floor should be selected in some building easy of access, having steam power and plenty of running water. A floor 50 by 75 feet, properly divided, is large enough to manufacture 500 pounds of butter a day. The rent of such a floor in a city like New York should not cost over $500 a year. The cost of fitting up such a factory will be about $2,500. For making 500 pounds of butter a day there will be needed one chopping machine, two melting tanks, one churn, two presses, three wash tanks, besides wash tubs, tin cans, cloths, &c. After paying for the fitting up of the factory, there should be at least $3,750 in bank, for several reasons. First, three days will elapse before any butter is ready for sale, and six weeks will elapse before the first butter sold is paid for.

Butter is sold in New York on six weeks' time, while the caul fat has to be bought for cash. The amount of fat needed to carry on the business for 39 working days will be 691.65 lbs. per day, which, at 10 cents per pound, amounts $69.16 per day; and 26,964.35 lbs. costing $2,696.43 for the period of six weeks. The tubs for the butter will amount to ten a day, which, at 15 cents each, will amount, in 39 days, to $58.50. The hands must be paid every week. There will be required 1 superintendent at $50 a week; 1 butter worker at $40; 2 boys at $6; 1 woman at $5; amounting in one week to $107, and in six weeks to $642 for labor. These, put in tabular form, amount to:

Fat, 26,964.35 lbs. for 6 weeks at 10c	$2,696 43
Tubs, 390 at 15 cents	58 50
Labor	642 00
Milk, ice, annatto, &c	353 07
Making a total of	$3,750 00

By combining the cost of fitting up a factory, with the amount of money paid out before any returns come in, $2,500+$3,750, it will be seen that it will not be safe to enter the business without a capital of $6,250. To find out the exact cost of manufacture several points must be ascertained: 1st. The expense per day; 2d. The amount of butter sold; 3d. The amount of refuse sold.

The following tables give the percentage of fat, oil and butter realized, which is necessary for the calculation of cost:

Percentages by the melting process in 100 parts:

Refined fat	78.63 per cent.
Soap grease	4.31 " "
Scrap membrane	17.06 " "
Total	100

By the pressing process, in 100 parts of refined fat:

Oil	76.31 per cent.
Stearine	23.69 " "
Total	100

Per cent. of oil from 100 parts of caul fat:

Oil	60.00 per cent.
Stearine	18.63 " "
Scrap and soap grease	21.37 " "
Total	100

By the churning process, in 100 parts of butter:

Oil	83.00 per cent.
Salt, milk, &c	5.00 " "
Water	12.00 " "
Total	100

Expenses per day at factory, in detail:

Fat—691.65 lbs., at 10c	$69 16
Milk—84 quarts, at 7c	5 88
Bicarbonate of soda, 1 lb., 10c	10
Salt—26 lbs, at 3c	78
Ice—60 lbs., ½c	30
Labor—(16 working days)	17 83
Rent—($500) proportion (259 days)	2 00
Contingencies	20
Total expenses per day	$96 25

Products manufactured:

Butter made from 691.65 lbs. of caul fat, 500 lbs. at 25c	$125 00
Stearine made from 691.65 lbs. of caul fat, 128.85 lbs. at 11c	14 17
Soap grease made from 691.65 lbs. of caul fat, 29.81 lbs. at 5c	1 49
Scrap made from 691.65 lbs, of caul fat, 117.41 ——	Loss.
Total for products manufactured	$140 66
Money realized by the business per day	$140 66
Cost of manufacture per day	96 25
Leaves a profit per day	$44 31

Cost of manufacture per pound of butter :

This will equal the expenses per day, minus the amount realized by the sale of other products ; thus if the expenses per day are.....$96 25

And the receipts from other products sold are..... 15 66

Will leave the cost of the manufacture of the butter at.....$80 59

This for 500 lbs., is equal to 16.1 cents per lb.

This calculation is based upon paying 10 cents a pound for the fat, and selling the butter made at 25 cents per pound.

COMPOSITION OF BUTTER.

Prof. Arnold, in his work on American Dairying, gives the composition of butter as follows: "The fatty matter which enters into the composition of the butter globule consists of four varieties. The hardest of them is stearine, which, when separated, is a hard, white, flaky appearing fat. The second in consistency is palmitine, which resembles palm oil; most of the coloring matter in butter is connected with this fat. The third is called oleine, from its thin, oily consistency. The fourth consists of essential oils of the food of the cow, and which probably are as numerous as the varieties of food she consumes. These constitute the fats of which butter is made. Their origin is not perfectly clear; they are all ultimately derived from the food of the cow, but how much of them are elaborated in the body of the animal out of other elements of food is not well established. Their characteristics change with the condition and quality of food, and with the constitutional peculiarities of cows. The fats from different cows living on the same food are often quite unlike, and in the same cow they change their qualities, such as color, density, odor and flavor, with the variations in food, as to its age, succulence and abundance or scarcity of fat in it. Young food generally gives a higher flavor and color to these fats than that which is mature or approaching maturity. The percentage of these essential oils which enter into the composition of butter is very slight, amounting, on an average, to about two per cent. They are very variable in butter, by reason of feed and faulty making."

BUTTER ANALYSES.

I present first an analysis of the fats of butter by Prof. Mott, giving the constituents in natural and artificial butter :

Constituents.	*Fats from Natural Butter*	*Fats from Artificial Butter*
Palmitin	20.33	22 32
Stearin	42.77	46 94
Olein	27.71	30.42
Butyrin, Caproin, Caprin, Caprylin — Essential or Vegetable Oils.	9.19	.32
Totals	100.00	100.00

Next is presented a complete analysis of butter :

Constituents.	*Natural Butter.*	*Artificial Butter.*
Water	11.827	12.005
Butter solids	88.173	87.995
Total	100	100
These butter solids are :		
Palmitin	16.826	18.307
Stearin	35.399	38.502
Olein	22.934	24.954
Butyrin, Caproin, Caprin, Caprylin } Essential Oils	7.606	.262
Casein	.183	.745
Salt	5.225	5.225
	88.173	87.995

The difference between *Natural* and *Artificial Butter.*

By comparing the constituents of these two analyses, it will be seen that the difference in the percentages consists chiefly in the very small amount of butyrin and other essential oils in the artificial product, and it is for this reason that the artificial butter keeps so much better than the natural butter. There is, says Mott, " a sufficient amount of these essential oils in the artificial butter to give it the odor and flavor of natural butter ; but not sufficient, when decomposed into butyric acid, to render the product rancid." It is the decomposition of these essential oils in butter that causes rancidity ; and this proves what I have frequently noticed, and contended for, that the *best*, and highest flavored butter, possessed the *poorest* keeping qualities.

I have now shown, as clearly as I could, the difference between oleomargarine and butter—the artificial and the natural compounds. The sources from which the two emanate indicate a wide difference. Natural butter, as we all know, is made from milk which is secreted by the mammary glands, while the artificial butter is first secreted in the ep-i-the'-li-al cells, located just underneath the derma, or true skin, and thence taken up by the sebaceous follicles and glands, and by them conveyed and stored away in different parts of the animal body, ready for future emergencies, arising either from accident or disease. The two products are secreted by entirely different organs in the animal economy, and we may reasonably expect to find as much difference in the two products of tallow and butter, as there is between *bone and muscle;* the tallow being comparable to the bone while the latter is comparable to muscle or flesh when considered as articles for human food. The difference in the melting points of the two articles is another case in point. Butter melts at a temperature of 86 degrees, while tallow will hardly melt, says Mott, at 109 degrees, a temperature within three degrees of fever heat (112).

Another great point of difference in the two kinds of butter, as we have already seen, is in the percentage of the essential or flavoring oils, which gives to our gilt-edged Jersey butter that highly prized nutty flavor. On this point of difference, Garret Cosine comes to the rescue, with his patent of Feb. 15, 1876, wherein he proposes to flavor his product of butter with any fruit or nut oil; and we may now expect to find butter flavored with walnut, almond, or any other nut oil to suit the taste of customers. Prof. Mott's labors, in the first place, were to discover a method of *destroying the grain* in the artificial product; while great care is enjoined by our modern dairy writers on us *not to destroy* the grain in the natural product. The former, when perfect, should possess no grain, while in the latter the grain is to be carefully preserved. Here, again, is another striking point of difference. His labors were also to produce an article that should contain no element *foreign* to the very best butter; but, by his own analysis, his artificial product *failed* to contain several elements (essential oils) which are considered necessary to the good qualities of the best natural butter.

The chief points of difference, then, between oleomargarine and butter are, first, the former contains a much greater percentage of stearine, a hard, white fat, and it should more properly have been named oleo-stearine. Another reason why it should receive the name of oleo-stearine is because it is chiefly made at those large abattoir factories from the fat or oil of *steers*.

Its chief merits I take to be:

First. Its usefulness for culinary purposes.

Second. Its adaptation for long sea voyages.

Third. By reason of its greater hardness, its advantages in excessively hot climates, such as Texas, for example, where they use butter in its liquid form from a cup, as we do molasses,

EFFECTS UPON THE MARKETS.

When Mott's calculations of the cost of manufacture (*16 cents per pound) were made, the product was then bringing 25 cents per pound. Now the price has fallen to 18 and 20 cents, while the price of butter made from cream has decreased in a corresponding ratio. We, as butter dairymen, have lost fully five cents a pound on every pound of butter we have made for the past year in consequence of the increased manufacture and consumption of this oleomargarine product. To substantiate this, I quote from the New York market reports. The *Tribune* of November says that dealers in butter are not prepared to make large contracts until they learn for a certainty how much their trade will be affected by oleomargarine.

Quite a large quantity of oleomargarine is now being shipped abroad

* This cost was obtained at an experimental factory where an abnormal price was paid for fat, as also abnormal wages. The cost at a large factory would be only about 12 cents.—*Note by Dr. Mott.*

in place of the genuine article, and a good deal is consumed at home; so that dealers can hardly be expected to buy large quantities of dairy or creamery butter, and pay from 24 to 30 cents for it, when an article is offered that answers the purpose for 15 to 18 cents. Again, the same paper of a later date reports that the demand for strictly first-class butter is good, but medium and poor grades are unsaleable. The daily increase in the consumption of oleomargarine affects the lower grades. The latter commodity is quoted at 15 to 18 cents, while the high grades of butter are worth 25 to 30 cents per pound.

Again, in a later date, the *Tribune* reports: "The demand for oleomargarine continues to increase. The makers of this article say that, with their present facilities, they are wholly unable to supply the demand. These demands are so urgent that additional facilities are in process of construction. Oleomargarine is selling for 15 to 20 cents per pound. Fine grades of butter are quoted at 24 to 34 cents."

We learn from these reports that oleomargarine is now selling at wholesale in New York city from ten to fifteen cents per pound lower than the best dairy and creamery butter.

Still later (December) the same paper quotes: "Oleomargarine is being brought into notice considerably of late by the prosecution of grocers and others who have been selling it as butter. The manufacturers are now churning it with cream, and making small prints of one pound each, tastily stamped for the Philadelphia and Baltimore markets. The manufacture is increasing, the factory at Pawtucket, R. I., having doubled its capacity. It sells now from 15 to 20 cents per pound."

To sustain my position I next give the Philadelphia wholesale butter market for the past five years:

In 1873 I sold 650 lbs.	butter	at an	average	price of	40c.	during	the year.
In 1874 I sold 657	"	"	"	"	37c.	"	"
In 1875 I sold 430	"	"	"	"	36c.	"	"
In 1876 I sold 560	"	"	"	"	35c.	"	"
In 1877 I sold 430	"	"	"	"	30c.	"	"

The extreme range of prices during these five years was as follows:

	Highest price.	Lowest price.	Average.
For 1873	50c.	25c.	40c.
For 1874	50c.	25c.	37c.
For 1875	45c.	25c.	36c.
For 1876	45c.	25c.	35c.
For 1877	35c.	23c.	30c.

The above represents the butter made on a farm which I rent, receiving one-half the butter sold. It is sent to Philadelphia every week and sold wholesale to dealers who retail it to their customers. We see by an examination that the price of butter has fallen in five years 10 cents per pound, and one-half of that (or 5 cents) during the last year.

In the year 1876 I sold our own butter, 1,740 pounds, at a home mar-

ket, at an average price of 40 cents per pound; and in the year 1877 we sold our butter, 1,656 pounds, at an average price of 35 cents per pound, being regulated as to prices charged, to some extent, by the Philadelphia market.

What is the cause of this decline in prices? There is no effect without a cause; and the effect stands out plainly and undeniably. The cause is over-production, and in producing this effect the hundreds and thousands of pounds of oleomargarine made daily has no doubt contributed its full share.

LEGISLATION.

The only question remaining to be considered is, What action do we propose to take in the matter for the protection of our interests? Oleomargarine has been pronounced by some of our best physicians as a proper and wholesome article of food; a fact, I presume, we are willing to admit, for most, if not all of us, are aware that a beefsteak is much better and more wholesome when cooked in its own fat, than it is when cooked either in lard or butter. If the use of oleomargarine were confined to the modest claims of H. W. Bradley in his first patent of 1871, to a new composition for shortening and culinary purposes, there need be no cause for apprehension; but when the arrogant claims of Garret Cosine, in his patent of 1876, comes before us with a highly colored and nutty flavored production for table use, it is time for something to be done. All that I ask, is for each article to stand upon its own merits. When Paraf, in 1873, organized in New York City the large company called the "Oleomargarine Manufacturing Company," and gave to the production the name Oleomargarine, they were pursuing a fair and legitimate business, to which no one could raise an objection. If they can succeed in producing an article that is superior to our highest grades of table butter, let it be done. But for some reason the use of the name of oleomargarine was discontinued, and the article was branded and sold under the name of butter. They had the benefit of the high-sounding name and title. Why drop that and adopt the less pretentious name of butter? Here is the point wherein our chief objection lies. Why brand and sell as butter that which is not butter? We are opposed to deception and fraud of every kind. And here is a fraud of the grossest kind—one the perpetration of which should receive the punishment provided in the proposed law prepared by the Board of Agriculture of our State, approved by the Solebury Farmers' Club at their meeting, Oct. 6, by the Bucks County Agricultural Society, Dec. 1, and by the Doylestown Agricultural Society, Dec. 8, 1877. If the manufacturers of oleomargarine are able to produce from dead bullocks an article equal in quality to anything we are able to make from the *living* cow, then let it command, as it will, an equal price in the market; if they, in the future, shall become able to make a product even *superior* to ours, let that bring, as it should, a higher price. What we demand is, and we deem it a protec-

tion to which we are justly entitled, that they shall not be allowed to sell *their* goods under *our* name and as *our* product.

SAMPLES OF OLEOMARGARINE.

The two samples of oleomargarine which are now before us, are the products, one of them, Sept. 27, of the manufactory in West Philadelphia, and the other I received, Nov. 27, from New York. Accompanying this latter specimen was a circular which demands some attention, and from which I learn that the product was manufactured at Pawtucket, R. I. (Reads circular.) The claims set forth in this circular are truly remarkable! 1. Its author claims, in the first place, that he is now offering to the trade "a pure cream-churned butter, almost absolutely free from *stearine*." Against this assertion I put Mott's analysis (whom he quotes), who gives for natural butter 35 per cent., and for artificial butter 38 per cent. of stearine.

2. The second claim set forth, is that his product is exactly the same as hand-made butter, except that in the refining process it is freed from that "fibrous material existing in hand made butter, which rots and becomes rancid, rendering it unwholesome and injurious as an article of food." This term, "fibrous material," is a new one given to those flavoring oils named by Arnold, Mott and others, butyrine, caproine, &c.

3. The third claim increases our astonishment; it is: "All butter is a fatty oil, chiefly secreted in the cauls of beeves, and brought into existence by the medium of milk, and is perfectly visible to the naked eye." Was there ever such profound knowledge of physiology displayed before! The butter is first secreted in the cauls and then *afterwards* brought into existence through the medium of milk and rendered visible. I am aware that the *Tribune* of Dec. 11th, quotes a French authority, who "came to the conclusion that the milk of a cow came from her fat." My authorities inform me that every part of an animal, including milk, fat, flesh, bone, hide, hair and horns, are all secreted from the *blood*, being taken up by different organs, and differing in quality in proportion as the constituents vary that are secreted by the different organs, but the blood is the grand repository of them all. Thus the mammary glands secrete the milk, the epethelial cells, and sebaceous follicles and glands secrete the fat, or tallow, &c., &c. My authorities for this are, Jos. E. Worcester, Prof. Arnold and the family physician.

4. The fourth claim is that "the butter is made wholly by machinery and is entirely free from the filthy hand manipulation." Here, perhaps, we may venture to urge in reply, that all natural butter is not made by hand; some of it is made by machinery and no hands touch it from first to last; and, in the second place, that all hands are not necessarily filthy. But, if this argument is good as against our butter will it not apply with equal force against our bread?

6. The sixth claim is evidently a misstatement. He quotes Prof. Mott to prove that his product contains more of the butter solids and less water than natural butter. Mott says in his pamphlet that natural butter contains 88.75 per cent of solids, and 11.25 per cent of water; and artificial butter contains 87.71 per cent. of solids, and 12.29 per cent. of water. But our hero has these tables reversed in his favor, and as the figures copied are correct, the inference is fair that the headings were changed intentionally.

7. We learn further, that this product is now sold in New York City and elsewhere as the best oleomargarine or creamery butter. The word oleomargarine is retained to comply with the law of that State, and the term creamery butter added for two reasons. First—The ignorant consumers are not presumed to know but what the term oleomargarine is the proper name for butter made from cream; and, Second—The artificial product is now actually mixed with genuine butter, as we learn from the latest market reports, thus adding the crime of *adulteration* to that of *deception*.

We learn from the *Tribune* report that oleomargarine makers have adopted the plan recently of mixing cream and butter with their product. The result of this is, that the article thus manufactured cannot be told, even by dealers, from the genuine article. It is stated that 40,000 pounds of this butter are used in New York daily. The law in New York prohibits the sale of it unless the packages are so stamped as to show what it is. In marking, a small stencil plate is used, and the name is generally placed in some obscure part of the firkin or package, and oftentimes this is easily removed, and dealers in butter acknowledge that they have bought it for good butter on the assertion of men whom they thought they could trust.

The only remedy is in a strict enforcement of the provisions and penalties of the law.

At the close of Mr. Reader's address, Professor Mott, of New York City, opened with an address defending the manufacture and consumption of oleomargarine, as follows:

OLEOMARGARINE BUTTER.

GENTLEMEN: In accepting an invitation to deliver a short address on oleomargarine butter, in justice to myself I would say that I am in no way connected with either the Commercial Manufacturing Company or the United States Dairy Company, nor have I been for the past nine months. Feeling a pride in the success of the process which, although discovered and patented by Mége, was elaborated into the process which is now adopted for the manufacture of the artificial product by myself, is sufficient explanation for the interest I take in this subject.

What is this cry against oleomargarine butter about? What does it mean? It has not been the principle of those most interested in

this new industry—the manufacture of artificial butter—to condemn the product of the dairy when properly made. No, gentlemen; if it were possible to make every dairyman in this country turn his attention to seeing that all the apparatus he uses is thoroughly cleansed, that his milk and cream are suitably protected from disturbing influences; yes, and even go so far as to see that the teats of the animal from whence the milk is obtained are thoroughly washed before milking, then would the country be flooded with good, wholesome butter, at a price that the poor of the land could all enjoy such a luxury as has been only rendered practical by the introduction of oleomargarine butter. Yes, gentlemen, cleanliness is the most important secret in the manufacture of good butter. One drop of milk left in your milk pail, your milk pan, your churn, soon becomes the proper medium for the development of the numerous germs of life which flock in our atmosphere—fermentation and putrefaction of this little drop of milk soon take place. Add now to either of these different apparatus fresh milk or cream, and that which was fresh and sweet before adding is now tainted, and itself in the process of decomposition. From such conditions no pure product can be obtained. Turn, I say, your attention to cleanliness in the manufacture, and not flood the market, as is now the case, with the butter which, before it has time to reach the consumer, has undergone the first stages of putrefaction, in the transformation of its volatile fats into rancid acids, which are most detrimental to health, and are one of the causes of the majority of sickness among the poorer classes, who are unable to purchase the pure, wholesome product, as the price of the same is so high. I claim that when Mége discovered that a pure and healthful product could be manufactured from the fat of the animal, to take the place of the miserable, rancid butter which now floods the market, at a price that the poor as well as the rich could enjoy it—that he conferred a great benefaction on the human race.

Is it possible, gentlemen, that you are willing to condemn the introduction of this product from no higher motive than that of dollars and cents, or because it is made by a labor-saving process? I look upon the fat of the animal as the fountain-head from which all butter is obtained. This is no assertion not based on facts. Look a minute. Recent analyses of blood have demonstrated the absence of fat, only fatty acids being present. From the blood, therefore, the fat cannot transude. Where, then, can it come from but from the fat of the animal? Elaborate experiments made in Paris on nurses, by M. Decasine, showed that when all food was taken away from the nurses for several days they still continued to give milk, and that the milk contained fat. Where did the fat come from? The answer is simple. It came from the fat of the nurse; and this celebrated chemist came to the same conclusion. In fact, he states in as many words, that when all food is taken away from the nurse, the infant, by act of Providence, receives milk at the sacrifice of the mother.

If, then, the fat of the animal is the fountain-head from whence all butter fat is derived, why insist upon limiting ourselves to the milk, a menstruum holding in suspension only about 3.75 per cent. of butter fat, when we can go direct to the fat of the animal and obtain sixty per cent? In one case the butter fat has to be separated from the fluid which holds it in suspension ; in the other from the caul fat which contains it. What is there unreasonable about this? Why is there such a cry against this labor-saving process? As well condemn the results of all modern inventions and labor-saving machines. Is the purity of the wheat impaired by being gathered by the reaper in preference to the sickle, as used in past ages, or the hay impaired by the use of the mowing machine? Have the great mass of people to go naked from the fact that the majority of clothing is now made by the sewing machine in preference to the needle? What would become of our fast-increasing annual crop of cotton if we were depending on the hand-shuttle to weave it into fabrics that find a market in every clime, in preference to the modern machinery as now used in the cotton factories of the East? Away with such selfish bigotry as would deprive the masses of this pure and wholesome element of food, because it is obtained by a modern labor-saving process which tends to destroy the profits now made, not by the sale of good butter, which will always find a market, but by the sale of that most injurious product, rancid butter, which no right-minded man should for a moment countenance. I have understood that the remark has been made that if the manufacture of butter from fat continues to increase, there is a chance of extinguishing the whole race of bovines. Let us look at this : I am informed on good authority, that within a radius of sixty miles of Chicago there are over 30,000 calves killed within three days after birth, for the reason that milk is more valuable to sell and to convert into butter and cheese. But if the new enterprise of shipping beef to England and France continues to increase, it will necessitate the raising of calves. Where then will the butter come from? The common-sense answer to this question is, that oleomargarine will have to step in and fill the demand, which it can easily do, as the amount of fat that can then be obtained will be greatly increased. This is no subject, gentlemen, to receive light attention. Look to the figures. Since the 1st of January last year until the 1st of January this year, there has been exported 102,138,504 pounds of fresh beef, at a value of $10,063,302, and of head of cattle 20,057, at a value of $3,987,540, making a total value of beef exported amounting to $16,050,842.

Truth does not fluctuate according to our likes or dislikes. The merits of the artificial product depend on the properties peculiar to the product.

Now, gentlemen, the properties of this product have not only merited the attention of the public, but have met with a hearty reception by them. Now, gentlemen, as this product has been accepted by the public, it is not then for the farmer and dairymen to question their likes and dislikes with respect to this subject. In my opinion there is no other way to express it. They (the dairymen and farmers) have got to accept it.

With respect to the business carried on by the Commercial Manufacturing Company, the only legalized company in New York and New Jersey, I have the following official statement: During 1876-77, the company disposed of, in one large contract, 3,295,000 pounds; and in another in 1877 of 1,000,000 pounds of oleomargarine. Up to March 3, 1877, the company had treated over 8,000,000 pounds of fat for use in the manufacture of artificial butter. In 1877 contracts for five years for 3,000,000 pounds of the products were offered, but declined by the company. Large offers are now pending the action of the company.

At the close of Dr. Mott's address a discussion of the question was taken up, and the speaker was plied with numerous questions. He gave a short account of the manufacture of oleomargarine, illustrating his account with some specimens of the materials used in the manufacture.

Mr. C. W. Horr, a dairyman from Wellington, made some remarks, in which he said he thought that the manufacture of artificial butter was perfectly legitimate, and so long as it was a good, healthy, palatable article, and people chose to eat it, certainly no dairyman had a right to say anything against it. It was no one's province to say what victuals people should eat. The only redress of the dairyman was to make an article of butter that would be an improvement over the artificial. Mr. Horr said that he could make an article of butter that was a vast improvement upon the oleomargarine, and he had no fear of the competition.

Dr. Mott said: With respect to the merits of the product it is, no doubt, better than the average butter put in the market. I refer to the oleomargarine produced by the Commercial Manufacturing Company, &c., where it is properly made. It is far more healthful than much of the butter offered, and is a great benefit to the poorer classes, as they can thus procure an article far better than the average butter, at a price within their reach. Quotations from the London market show that it brings there only from twenty to twenty-five shillings less than the best cream butter. Supposing that it would be interesting to have the exact product here for you to inspect, I have brought these specimens of the different products used in the process of manufacturing oleomargarine, intending to complete or finish the process in your presence, which would consist in churning or agitating the oil with milk. I did my best to obtain the necessary milk, making application at every firm in the City, but failing here, I telegraphed twenty miles in the country, but could not obtain it in time. We can make butter from fresh cream, but this requires milk that is turned, and this I was unable to obtain. The manufacture of oleomargarine butter is a very simple and common-sense process. I think, from what I have stated, it must appear that the fat found in the milk came originally from the fat in the animal. In the manufactory only the caul of the animal is used for oleomargarine, the other

part of the fat is taken to the tallow department to be converted into tallow. It is thoroughly washed and sent up to the top of the building and then put into hashing machines, when it is reduced to a pulp; after which, it is melted at the lowest possible temperature, which is about 118°. The adipose membrane settles at the bottom and the oil is then drawn off into kettles below. It is allowed to remain in these kettles till all the adipose matter is deposited, when it is drawn into the granulating room, after testing to see whether it is in a proper condition to be pressed. It is then pressed by hydraulic presses, seven in number, each of which cost fifteen thousand dollars. These presses press out the oleomargarine, leaving the stearin behind. The oil to be converted into butter is then run down stairs into the next factory room, where about one hundred pounds of it is put into a churn with about twenty pounds of milk and agitated for about twenty minutes. It is then run into a tub containing pounded ice, by means of which it becomes solidified and crystallization is prevented. It is afterwards placed upon tables, the ice melts off, and the next morning it is put into a churn with more milk and agitated twenty minutes longer, during which operation it takes up the essential characteristics of the milk. It is then placed upon tables and the milk worked out, when it is salted and packed ready for sale. This is the process of manufacture as carried on by the Commercial Manufacturing Company. Great care is exercised and every pound of the butter is free from foreign substances. There are infringments of this patent, by parties not knowing the exact process, and who are doing great damage, not only to you but to this company which makes the pure article.

Mr. Lewis: How do you know that the fat of butter comes from the fat of the animal and not from the blood?

Dr. Mott: We know that if a nurse be deprived of food, nature provides for the sustenance of the young by drawing upon the mother's fat. Every deposit of the animal is secreted by the blood, and although no fat is found in the blood, fatty acids are, which undergo chemical combinations by the vital forces of the body, and are converted into fat.

Ques. What is the amount of oleomargarine obtained from the caul fat?

Ans. One hundred pounds of caul fat will produce sixty pounds of oil and seventeen pounds of stearin.

Ques. How much would you receive from a large animal?

Ans. On an average, from forty-five to fifty pounds. This was the average obtained from one thousand animals slaughtered.

Dr. Mott: It is no doubt the fault of the farmer that oleomargarine butter or cheese has an existence. It was produced to take the place of the poor rancid butter which is unfit to eat.

Prof. Arnold: At what temperature do you put it to press?

Dr. Mott: At 85°. The oil is then cooled to about 70°. In a liquid state a great deal of heat exists in a latent state in the oil which can only

be removed by a chill. The small quantity of essential oil mentioned, which it absorbs from the milk, is sufficient to give it the required odor and render the product far superior to the average butter made and sold.

Ques. What does oleomargarine usually bring?

Ans. From eighteen to twenty cents per pound at wholesale.

Ques. What is the expense of making it?

Ans. When fat can be bought at five cents I believe this butter can be made and sold in the market for about eleven cents. Large quantities are sold. The manufacturers cannot fill the orders fast enough. It is exported by the ton. There is to be a reward of one thousand dollars offered for the detection of infringers of the patent. So highly is it esteemed that the name, oleomargarine, is considered an inestimable trade-mark.

Ques. What part is the caul?

Ans. It is the fat which surrounds the stomach of the animal.

Ques. Does the kidney fat contain too much stearin, did you say?

Ans. Strictly speaking, the mixture consists of stearin and palmatin. In kidney fat the per cent. of stearin is too large to be profitable for butter-making.

Ques. Does it have a deleterious effect on butter if it be packed in tin cases?

Ans. Yes, when it comes in contact with the tin it is bleached white. The bleaching may probably be owing to the formation of ozone, by the tin surface acting upon the air.

Ques. You speak of running the oil on ice to prevent crystals from forming, now, would not that destroy the grain essential to good butter?

Ans. No; if allowed to cool slowly regular crystals would be formed which are quite different from the grain of butter, but by the sudden chill, upon ice, crystals have not time to form and the product is smooth and pliable.

Prof. Stewart: On this question of Oleomargarine, I would say, that dairymen may as well possess their souls in patience. If they can make a good article, that is really palatable and wholesome, it will be a blessing—a real God send—not only to the poor classes but to the dairymen themselves. It will prevent the manufacture of thousands of pounds of bad butter now made that is not fit to throw to the dogs. In this way it will encourage the making of first-rate butter and thus it will be a blessing to dairymen. Though there may be millions of pounds of butter made from caul fat it will not materially affect the price of really good butter; if it does at all the effect will be but small. There will always be a market in England and European countries for a first-class article of butter.

Mr. Horr: I would not hesitate to establish creameries on a large scale. This article will never come in competition with crack butter.

If it comes in competition with butter at all, it must be with that of poor grades. Now, if the oleomorgarine manufacturers can make it to satisfy the people, they have a right, a moral and legal right to do so. If it is a good, healthy, palatable article, and people choose to eat it, certainly no dairyman has a right to say anything against it. It is not our province to say what victuals people must eat. The only redress dairymen have, is to make an article of butter greatly superior to the artificial. I am certain that I can make butter that is vastly superior to oleomargarine, and I don't care how much they make. If dairymen cannot, from cream, make an article of butter that will compete with that made from gut fat and shove it out of the market they deserve to be beaten. (Laughter and applause). I have no fear of the result. Cheap, inferior butter must go out of the market. We must make nothing but the very best article. Let each be sold on its own merits. Let oleomargarine be sold for just what it is. If you will do that, I have no fear of the result as to which will win in the race.

Dr. Mott: I have listened to Mr. Horr's remarks with great pleasure. With reference to oleomargarine I can assure him that there is no chance of its dying out. There are millions of dollars invested. Gentlemen of known ability and extensive means are engaged in it, and there is no chance of its falling through.

The Committee on Order of Business then made their report.

After which, the next subject taken up was "The condition and quality of the fats in milk and the changes by which they are converted into butter," regarding which Dr. H. A. Mott, Jr., read the following interesting address:

Gentlemen: The subject which I have chosen to invite your attention to, is one suggested by your most indefatigable worker—Professor Arnold—"The condition and quality of the fats in milk and the changes by which they are converted into butter." Let us consider the first portion of our subject, and then proceed to the discussion of the last. When a drop of milk is examined under the microscope, myriads of beautifully formed globules of various sizes will be seen suspended in a clear liquid. These globules are known as milk globules, are of slight yellow color, dark around the edges, and exhibit a pearly gloss. It is within these microscopic spheres that the fat of milk is contained. The state in which these globules exist in milk has been a subject of considerable discussion, but under the persistent endeavors to solve the problem by distinguished microscopists, it is held now by the best authorities that the fat globules of milk are surrounded by an envelope. (For an elaborate discussion of this subject see the American Dairyman, November 20 and December 6, 1877, by the writer.) The exact nature of this envelope has not been actually determined, but experiments made by Prof. Arnold, as also by myself, convince me that it is not of the same composition as casein, but more probably consist of the same nitro-

genous material known as adipose membrane. This idea I consider is both consistent with my experiments as also with the accepted method of formation of the milk globules by a process of budding. The experiments by Dr. W. Fleischmann (Versuchs—Stationen Organ xiv., 194–245.—Jour. of Chem. Sor. vol. x., 1872, p. 258) to demonstrate the existence of an envelope, as also the thickness of the same, are not generally known, and therefore must prove interesting. Fleischmann proceeds to treat the subject mathematically, starting from the facts that the specific gravity of butter is .942, and the diameter of the fat globule from .01—.0016 m. m., and having shown that the velocity of the globule must vary as the square foot of their radius, he proves that if the serum of milk be regarded as a perfect fluid, the whole of the globules must rise as cream in thirty hours, even if they were of the smallest size known to exist, and that consequently the globules of ordinary milk should rise in far less time than this. In practice, however, only about eighty per cent. of the fat globules rise as cream after twelve hours standing, and the most prolonged repose does not yield more than eighty-five or ninety per cent. The globules which obstinately refuse to rise have a diameter of .0038—.0016 m. m. Fleischmann concludes that the globules are impeded by adhering matter, and proceeds to calculate its quantity. Taking the specific gravity of casein as 1.486, he finds that a coat of this substance .000053 m. m. in thickness will suffice to prevent the globules of .0038—.0016 m. m. diameter from rising, while it will allow the larger globules to do so. Further, supposing the fat to be equally distributed throughout the whole series of globules, he finds that about 20 per cent of the fat will occur in the form of small globules which cannot rise, which is, in fact, the result arrived at in practice.

The following analyses I have placed together, to illustrate Fleischmann's mathematical demonstration :

Constituents.	*Milk.*	*Sk. Milk.*
Milk	86.82	90.52
Milk, solid	13.18	9.48
	100.00	100.00
Fat	3.26	.65
Casein	4 77	3.24
Milk, sugar	4.46	4.82
Inorganic salts	0.69	.77
	13.18	9.48

If we compare the percentage of fat 3.26 per cent. in the milk analyses to the percentage of fat .65 in the skimmed milk analyses, we will find that .65 per cent. is almost exactly 20 per cent. of the original fat.

There can be no doubt but that good butter is to a very great extent dependant upon the quality of the fats which compose the fat of milk. Unfortunately science has not as yet been able to plan a method of

analyses so that the quantity of each constituent fat which composes butter-fat can be determined, but by qualitative analyses we are informed what fats are present, which may be tabulated as follows :

BUTTER-FAT.

Composition.	*Discovered by.*
Palmatin	Heintz (Gmelin's Handbook) xvi. 343.
Olein	Chevreul (Reserches sur les corps gras) p. 205.
Stearine	Chevreul (Loc. cip.)
Arachin	Gössmasm and Scheven (Ann.
Butin	Ch. Pharm. xcvii
Myristin	Heintz (Pogg. Ann.) lxxxvii. 267; xc. 137; xcii. 4 29.
Butyrin	Chevreul (Loc. cit.)
Caprin, Rutin	Chevreul (Gm. xiv. 485.)
Caproin	Chevreul (Gm. xi. 414.)
Caprylin	Lerch (Gm. xiii. 190.)

All of these fats are composed of three parts of acid united to one part of glycerine as a base; in such union three atoms of water are liberated. The reaction may be represented as follows :

$$3\,\{C_{20}H_{40}O_2\}\ \{C_3H_8O_3\}\ \{3HO\}\ \{C_{63}H_{122}O_6\}$$

Arachinic acid. Glycerine. Water. Arachin

The fats then, should be, more strictly speaking, called respectively, Tri-Olein, Tri-Palmatin, Tri-Stearin, etc.

It may be interesting to some present to know that by actual chemical tests I have demonstrated the presence of all constituent fats which go to make up natural butter-fat in the fat of artificial butter or oleomargarine butter. The great problem which now remains, since it is shown that the artificial butter-fat contains exactly the same constituents as butter-fat, is to find out the exact percentage of each constituent, a problem which, I have already said, science has not been able to grapple with as yet. I am, though, assisted by Professor Elwyn Waller, attempting the solution of this most difficult problem, which I hope soon to accomplish. The result of my analyses, I think, will show a difference in the percentage of most of the constituents, especially the fats of the volatile acids in artificial butter-fat when compared with the average fat of natural butter, but I do not believe the difference will be so great as exists between the extremes of the percentages of each constituent in natural butter-fat. In other words, I mean to say that between the different qualities of natural butter-fat there exists a greater difference in the percentages of each constituent than will be found to exists between the percentages of the constituents of artificial and the average natural butter-fat. This is more or less of a speculation at present, though, which, on the completion of my analysis, will be solved.

As has been already stated the fat of milk exists in this fluid in the form of microscopic globules, surrounded by a very thin, delicate membrane. According to very elaborate investigations by Dr. Sturte-

vant, it has been shown that the diameter of the globule varies with the breed of the animal from which it is obtained. That is to say, the milk globules of the Jersey cow is larger than that of the Ayrshire and the American Holstein, and the milk globules of the Ayrshire cow is smaller than that of the Jersey and intermediate in size between those of the Jersey and Holstein; and, further, the milk globule of the Holstein is the smallest of the three. Further experiments demonstrated that if samples of the Jersey, Ayrshire and Holstein milk were placed in a per cent. glass, under like conditions, it will be noticed that the cream will rise in each sample with a different rapidity, the larger globules (as might be expected on account of their less specific gravity, reaching the surface first; but the rapidity with which the whole of the fat globules arise depending in a measure on the evenness or unevenness of their size. It is for this reason that the percentage of the cream layers can never be a standard for its richness; for where the milk globules in Jersey milk would rise in four hours, it would take them in some samples of Ayrshire milk ten hours to rise, while the globules in Holstein milk, owing to their evenness of size, rise in five hours.

The philosophy of raising cream becomes quite an interesting subject when the above facts are taken into consideration. I would say here that in the columns of the American Dairyman for December 13, 1877, I think this subject has been masterly handled—the views put forward agreeing perfectly with my own views on the subject. The facts to be taken into consideration are:

First. The milk globule has a less specific gravity than the water or any other constituent of milk.

Second. If the milk is allowed to stand at a high temperature, conditions are immediately produced suitable to the growth of the little fungus plant, penicillium crustaceum, and the milk commences to sour before the cream has a chance to form.

Third. Water and casein, etc., grow cool much faster than the milk globules.

Fourth. Since the diameter of the milk globule varies in different breeds—a system which would be practical for the milk containing the largest globules—might totally fail if applied to any other milk. What is needed is a system applicable to mixed milk.

Fifth. While the milk globules expand more by heat, and contract more by cold, than the water of the milk, still they are poorer conductors of heat than the water and casein of milk, and consequently expand more slowly on the application of heat, and contract more slowly on the application of cold.

It would not be difficult from these facts to reason that the proper system to be adopted is to place the milk in a room, the temperature of which is a few degrees below the lowest point which it is desirable for the milk to reach. By adopting this means, the milk from a warm

state is cooled gradually down, which sends the milk globules rapidly up, not only for the reason that the fluid in which they are suspended becomes cooled faster than the globules, but because at the same time it becomes heavier.

Dr. John Barclay and Mr. Alexander Allen, some years ago in Scotland, conducted a number of experiments to determine the best temperature for churning cream. The following table is given by them:

Number.	Date of the experiments.	No. of gallons of cream.	Weight of the gallon of cream		Temperature during the operation.		Time of the Experiment.		Total quantity of butter obtained.			Quantity per gallon.		
	1823.		lbs.	oz.	Fhr.	Ct.	h.	m	l	bs	oz	l	oz.	d.
1	August...18	15	8	.4	55	12.8	4	0	29		.8	115	75	
2	August...26	15	8	.2	60	15.5	3	15	29		.4	115	32	
3	August...30	15	8	.2	62	16.7	3	0	28			114		
4	September 4	15	8	.1	64	18.2	3	1	27			112	127	
5	September 9	15	8	.1	70	21.2	2	30	25		.8	110	106	

The butter produced in the first experiment was of the best quality, rich, firm and of agreeable taste.

The second experiment produced a butter of good quality, but of less consistence. The fourth experiment gave a butter soft and spongy.

The butter obtained from the fifth experiment was decidedly inferior to the preceding. From the preceding experiments it appears that cream cannot be kept at a high temperature during churning.

In the first experiment, where the temperature was the lowest, the quantity of butter obtained was in the largest proportion relatively to the cream employed, and in the others, where the temperature was augmented, the quantity of butter diminished proportionally. In the last experiment, where the average temperature of the cream was elevated to 70° F. (21°.2 C.) not only the butter diminished in quantity, but was of very inferior quality to the taste and appearance. Another result of the preceding experiments, that the temperature on the other hand must be kept low when the butter is churned, the specific weight of the churned milk is diminished in proportion as the temperature of the cream is elevated, and when the temperature is low the butter which composes the lightest particles of the cream condense more completely, than if the temperature was more elevated, and in which case the churned milk has a higher specific weight. From these experiments,

M. M. Barclay and Allen came to the conclusion that the best temperature to commence churning cream is from 50 to 55° F. (10 to 12.8° C.); that in no moment in the operation must it exceed 65° F. (18.3° C.).

John Ballantine, in Edinburgh, in 1825, also made some experiments. The following table is given by him:

Number.	Dates. 1825.	Pints of Cream (Scotch)	Temperature of the Cream. F.	C.	Temperature when the Butter formed. F.	C.	Quantity of Butter obtained. lbs.	oz.	Time of Churning.	Pounds of Cream, 16 oz. 1 pound. lbs.	oz.	Temperature of the Atmosphere. F	C.
1	Ju 13	16	56	13.3	60	15.5	16	8	1½	4(1)		56	13.3
2	Ju 20	16	52	11.1	56	13.3	16		2	4		52	11.1
3	Ju 24	16	52	11.1	56	13.3	16	.	2	4		52	11.1
4	Jy 12	16	65	18.3	67	19.4	15	8	½	3	14	70	21.2
5	Oc. 20	16	50	10	53½	12	15	12	3	4	1	50	10
6	Oc. 20	16	53½	12	57½	14.1	16	5	1¼	4			

No. 1. Sample the largest in quantity produced at the degree of heat employed.

No. 2. Butter of the best quality.

No. 3. The savor and the quality of this butter cannot be surpassed.

No. 4. Butter less white and milky.

No. 5. Quality altered by long churning.

No. 6. Butter of excellent quality, of a decided savor and color, and solid like wax.

Ballantine says: The temperature at which, perhaps, the butter separates from the cream, is between 45 and 75° F. (7° 9 and 23° C.) But from the above experiments it appears that the largest quantity of butter is obtained when the temperature is 60° F. (15° C.) from a given amount of cream, and the best quality butter at 55° F. (12°. 8 C.), the tempe ature taken in the churn the minute the butter forms.

From the above experiments by Ballantine, it will be seen that the conclusion arrived at by Barclay & Allan are correct. That the best temperature to commence the operation of churning is about 55°, and at no time in the operation ought it to exceed 65°, while, on the contrary, if at any time the cream should be under 50° Fahrenheit, the labor will be much increased without any proportionate advantage being obtained. This agrees with the American practice. It must be observed, however, says Willard, "that the agitation of the cream, in churning, should be

regular; neither too quick nor too slow. If the agitation is too quick the butter will make and unmake itself before the churner is aware of it, as too rapid action induces fermentation, which, when it has reached a certain point, is entirely destructive of anything like the possibility of making even good or well-tasted butter. If, on the other hand, the motion be too slow, the agitation in the churn fails to produce the desired separation of the component parts of the cream, and the consequence is, that after a good deal of time spent in lazy action, the churner is just as far from his butter as he was at the beginning of his labors.—*Practical Butter Book, page* 137.

Cream, according to Mr. Ayton, may be safely churned in an hour and a half, while milk ought to obtain from two to three hours. Johnston says that churning ought to be "slower in warm weather, that the butter may not be soft and white, and quicker in winter, that the proper temperature may be kept up." Jonston, when speaking of over-churning, says: "When the process of churning is continued after the full separation of the butter, it loses its fine yellowish, waxy appearance, and becomes soft and light-colored." The weight of the butter, however, according to Dr. Trall, is said to be considerably increased; and hence that in Lancashire over-churning is frequently practiced in the manufacture of fresh butter for immediate sale.

CHURNING THE WHOLE MILK.

I do not propose to discuss this subject at length here, for I have just sent to the AMERICAN DAIRYMAN an article on the subject; but this I will say, that churning the whole milk is but little known, but by those who have practiced it, it is claimed to yield more butter and better flavored butter than by setting the milk and churning the cream. Mr. Dewitt, in a memoir, states that the best butter is made by churning the milk. C. Peterson has shown that when cream is churned it takes from 16 to 17 litres (16.90 to 17.96 quarts) to make a pound of butter; but when the whole milk is churned about 14 litres (14.79 quarts) is sufficient. J. Zoller, of Oswegatchie, New York, in 1861, states that he has obtained 10 per cent. more butter by churning unskimmed milk which has become sour, than he has obtained from churning the cream of the same milk. Churning the whole-milk is recommended by Mr. Rensselaer Day, Hon. T. D. Curtis, R. L. Allen, and others. Mr. F. D. Douglass claims to have investigated into the merits of the system of butter-making, and after advancing his views decided not to adopt it. In my opinion, the views advanced are at best only theoretical, as Mr. Douglass says they are not based on actual trial. I do not find recorded any statements against churning the whole milk, except by persons who have never practiced it, but on the contrary, by those who have experimented, all agree that the yield of butter is greater and the flavor and odor far superior to butter made by other methods. I

fully agree with Mr. Curtis, who says that more experiments ought to be made with churning the whole milk, for, from a scientific stand point, I believe it will be found that the whole-milk churning will produce a butter having an odor and flavor far superior to butter churned from cream, other things being equal.

The theory I entertain with respect to the formation of butter in the churn is as follows: By the rapid agitation of the milk-globules against the dasher and sides of the churn the envelopes are broken, thereby setting free the enclosed fat, which, by the continued agitation, provided the temperature is right, unites together to form lumps, which are known as butter. If the milk is too cold the globules will not adhere, and the milk may be agitated for hours without producing butter. Again, if the milk is too warm, agitation merely produces an emulsion, since the fat is in the fluid state and not able to unite in lumps, any more than you would expect an oil that is liquid at one temperature to become solid at the same temperature.

Ques. A member: I would like to ask Mr. Horr if he churns sweet cream?

Ans. We generally let it stand till it becomes what is called loppered.

Prof. Arnold: There is a little larger per centage obtained, varying from five to to ten per cent. if you churn immediately, as it begins to sour. If you wait till it sours there is a loss in quantity and in the quality of the butter also, as you might reasonably anticipate. The cream which rises first will, from its exposure to the influence of the atmosphere, deteriorate if left too long. The quality as well as the quantity of butter also depends on the manner in which the churning is done. If you use a rotary churn for instance, one in which floats or paddles are used and made to move through the milk, you will do all the churning by means of friction. The largest globules will be done first, and then those next in size, and so on. If, on the other hand, a churn were used by which force can be applied equally to the whole mass of milk, such as can be obtained by the use of a dash churn, the dash of which would equal about three-fourths of a horizontal section of the churn, you will, by the motion of the dash, effect the whole mass equally with the downward pressure, and you will bring the butter more evenly and obtain about ten per cent. more. But if your dash were only one-fourth the size of the churn and full of holes and interstices, its operation would then be that of friction, requiring a longer time in churning and producing less butter.

Mr. Middaugh: In all the observations I have made, I believe better results may be obtained by churning the whole-milk.

A gentleman from New York lately said to me, "You may make good butter from cream, but if you want first-class butter you must churn the whole milk; you will then have butter of good keeping qualities, and it will command a good price."

I find the dash churn the best, and like to have the dasher raise about four or more inches above the milk, so as to come down with a pretty heavy blow. I find by that means the butter comes altogether, and is more solid and firm. I have tried to find the comparative values of milk from different patrons, or different cows, by taking a cup of each before the cream rises, coagulating it, and weighing the curd, with an exact pair of scales. I would like to know whether I can in that way really get the true value?

Prof. ARNOLD : You cannot manage small amounts with sufficient exactness as to moisture. There is no rule, without drying it down to absolute dryness. This is no criterion for butter.

On motion, the convention adjourned till 7 o'clock P. M.

Tuesday Evening Session.

Mr. John Gould, President of the Western Reserve Association, opened the evening session at 7:30 o'clock.

The Chairman announced that the next subject for discussion was "Refuse of the Dairy—Its Use and Abuse."

The speakers who were to introduce this subject being absent, Mr. Lewis was called upon to offer a few remarks.

Mr. LEWIS : Really, Mr. President, I did not come expecting to say anything on this subject. The only use I make of the refuse of the dairy is to feed it to Shorthorn calves. I take what butter I can from the milk and the rest I feed to Shorthorn calves. I think I can get more money out of it that way than by making both butter and cheese.

Mr. FARRINGTON being called upon, said : I feed the refuse of the dairy to the hogs. This is all I know what to do with it.

Prof. STEWART being then called upon, said :

Mr. PRESIDENT AND GENTLEMEN—The refuse of the dairy has not been sufficiently husbanded. It is capable of making a great many more dollars than is generally done. I have experimented somewhat by feeding skim milk to calves, taking the calf at ten days old, and feeding nothing but skim milk, supplemented with a little oil to supply the place of the cream taken off. Allow me to say that farmers are apt to run too much to one thing in the way of food. What you should always endeavor to do, is to give the animal a mixed food. That will furnish all the necessary ingredients. If you will take a little oil cake, or linseed, and mix with the skimmed milk as a substitute for the cream which has been taken away, its value will be greatly increased. Now I am about to make a very strong statement. If some of my friends will give me five or ten calves, averaging with those of the ordinary Shorthorn raisers, I will agree to make my ten weigh as many pounds in a certain number of months as they can, and allow theirs to run with their dams, while I will give mine no sweet milk after they are ten days old. I once took a calf, which weighed only sixty pounds. My friend, Mr. Lewis, will say that

that was rather a small specimen. A good Shorthorn will weigh one hundred pounds. This weighed only sixty pounds. I discovered that it was a splendid eater. You cannot make a large calf, a large pig, or a large anything, that won't eat. I fed that small calf skimmed milk and flaxseed and when it was four months old it weighed four hundred pounds. These statements are based upon the authority of the scales, which is better than anybody's guess. The food was weighed and the calf was weighed. In one ten days that calf gained 37 pounds, and the following nine days it gained 30 pounds. You can use something a great deal cheaper than cream to feed calves. I have found that it takes 20 pounds of skimmed milk to put on one pound live weight, up to six months, on an average. And here I want to illustrate a point. When the calf is two, three, or four weeks old, say between two and four, if it be a good eater it takes but eight or ten pounds to put on one pound of live weight. Here you can figure for yourselves and see the amount you can make out of skimmed milk when properly fed. I figured up the value of the extra food fed to the calf which weighed four hundred and forty pounds when killed, and the cost was $3.75. If it had been raised in the ordinary way it would have been considered worth about $5, perhaps. What cost $3.75, was made to increase to at least $10. Now a pig takes less to make a pound of live weight. It takes less to put a pound on a pig than a calf—less to make a pound of pork than a pound of beef. If you feed a pig all that it can eat and digest, you will find that an average of 15 pounds of skimmed milk is required to one pound of live weight, until it weighs 200 pounds. It must be remembered that whey does not of itself contain all the flesh-making and bone-building qualities that are necessary to support life. Whey contains a large portion of sugar, but sugar will not grow muscle and bone. These must be made out of different materials. You must add a certain amount of oil meal to the whey. Oil meal is rich in nitrogenous elements which make muscle. You will perceive a little oil in the whey sometimes, and a little more sometimes than there ought to be for the profit of the dairy. Now if you add to one gallon of whey a half a pound of oil meal, and feed to your calves and pigs, in health it will make up for the loss of the constituents taken away. It should be scalded either in hot whey or hot water. Calves and pigs become fond of oil meal after using it for a time. It is easily obtained, and will richly pay for the trouble of getting it. In one particular case, when I was experimenting with some cows, I bought a certain number of pigs and fed them with the whey, and determined how much I could make out of it, provided I did not credit anything to any other material except what it cost. The whey was not allowed to run into the tank. It was fed as sweet as possible. I took the cost price of the pigs and the cost price of the other materials, and found a balance of ten dollars in favor of every 4,000 pounds of whey. The cows produced about 5,000 pounds of milk apiece; the whey was about 4,000

pounds for the season. All farmers should remember that their animals require a variety of food. They should learn how to combine the different elements so as to make a good normal food.

Ques. Which is preferred for feeding, skimmed milk or whey?

Ans. There is a larger proportion of muscle-forming material in the skim milk. By taking a small quantity of boiled flaxseed or oil meal, and mixing with the milk, it will grow a calf as fast as new milk.

Ques. Will you please to state whether you feed the skimmed milk when sour?

Ans. It is generally sour, although we try to feed it as soon as possible after it is skimmed. It rapidly ferments, and, therefore, you should feed it as early as you can.

Ques. How do you like shorts?

Ans. It is excellent; so is pea meal, middlings and bran. Ground oats is another excellent food, rich in muscle-forming material.

Though read in a later date in the proceedings of the convention, the following paper, read by Prof. W. B. Lazenby, of Cornell University, prepared by Mr. J. S. Van Duzer, of *The Husbandman*, is placed in this connection from its being a part of the discussion of the subject on which it treats.

REFUSE OF THE DAIRY.

It has been said that a French family would live well on what an average American family throws away, and it is probably as true that the average French farmer would be satisfied to receive as his yearly revenue what he could make out of the wasted refuse of an average American farm. One of our national sins is wastefulness. We are called a money-making people. Farmers need to practice more economy in their business and less penuriousness with themselves and their families. I have known many farmers who would pinch a cent until it needed to be remonetized, who were every week wasting dollars in their business management. The sharpest business men in our cities, our successful manufacturers and merchants, are careful and saving in their business. They aim to utilize everything they handle and make the most of it; for what they have to sell they aim to get the highest possible price and for what they buy they pay as little as possible. They waste nothing that care and ingenuity can save. They realize that time is money, and husband their own and that of their employers. Are farmers as business-like in their management? Have you ever stopped to estimate the number of acres incumbered with unnecessary fences? Have you thought of the waste there is in using poor implements which do work imperfectly and vex those who use them? Have you fully counted the cost of spending your time with poor, weak teams? Do you know what you lose by illiberally feeding and scantily sheltering your cows, or by keeping poor ones? Have you sufficiently comprehended the importance of saving all the manure you can, and making the wisest use of it? Or do you per-

mit the liquid excretions of your stock to waste, and the solids to lie under the eaves of your barn until their virtues are washed out? I might continue to enumerate ways in which too many, far too many, farmers fall short of a close, intelligent arrangement of their farms and stock; but a special topic has been assigned me by your worthy Secretary. It is "The Refuse of the Dairy, its Use and Abuse." The miller grinds the wheat and takes out the flour. That is the most valuable, but he does not throw away the bran. The butter or cheese-maker takes out of the milk either the one or the other or both of these valuable articles of commerce, and has left on his hands the buttermilk or whey. What shall be done with this refuse? How can we dispose of it to the best advantage, with the greatest profit, is the question before us. Instead of deriving profit of it many factories have permitted it to go to waste, and worse than waste. I have seen factories where the floor of the manufacturing room was open so that the whey ran through, soaking into the ground beneath. The whey is lost, but its loss is the least of the evil consequences of the practice. The ground becomes sour. Stagnant pools of filth and slime are there to breed flies from, and foul smells to taint the milk, injure the cheese or butter, making it equally disagreeable to the manufacturers and injurious to his product. So much has been said at our dairymen's meetings of the importance of cleanliness, that I am willing to trust some of my friends who are to address you to treat the subject fully, but I want to say that the curing room of a factory should always have a good, smooth, light floor made out of planed and matched hard wood. It should incline slightly to one side, where there should be a neatly painted tin gutter to receive and carry off the washings of the floor into an underground drain. None of the whey should ever get on the floor, but it should be run off from the vats in pipes to some convenient tank or receptacle sufficiently remote from the factory to be harmless if it does become sour or foul in any way. Having taken this precaution, it is of very little consequence, except as regards the profit derived from it, how it is disposed of, unless the patrons carry it home in their cans. If this practice is permitted, then there is another claim for trouble. Perhaps three-quarters of the patrons of a factory can carry whey in their milk cans with impunity, because their cleanly wives will see that the cans are promptly and thoroughly washed, scalded and made sweet. But the other quarter—there is the rub—or rather the lack of *rub*, for the cans are only poorly rinsed when the milk is put in, and it comes to the factory sour, or so nearly sour, that it hastens the fermenting of the whole vat, and in the hot weather of Summer the purest can is none too good to keep milk sweet and in good order to get the best possible results from it.

It is a much more economical and profitable way to dispose of the whey at the factory, especially if it is to be fed to swine, for one man can take care of all the swine necessary to consume the whey of the factory

with no more labor than is required of the farmer, who has ten cows, in carting home his proportion of the whey and giving it to his swine. If the whey is to be fed to calves, the advantage of keeping them at the factory is also great, but not for the same reason. To make calves do well on whey feed, it should be given to them sweet, right from the vat, with a little addition of grain; red middlings and corn meal are good, and oil meal, I suppose, is still better.

But the objection to feeding whey to calves are that they require much more and nicer care than is necessary with swine. It is difficult to secure a lot of equal age and feeding qualities. Some will eat more sweet whey than is good for them. I lost one calf from one feeding in sweet whey. Others need to have their appetites encouraged. To keep calves successfully, arrangements have to be provided for keeping a few in a place, or, what might be still better, providing stanchions in which to place them when feeding. But one other objection is in the way of calves for taking the refuse of the factory. They are not the staple cash article that pork is. You can sell your hogs at any time, when you have them fattened, for cash. With such calves as you can make on whey you must take your chances in finding a customer. What you get for them does not depend so much on a fixed market value as on your good luck in finding some one who wants just what you have to sell. I fully believe that the proprietor of a factory, as a general thing, could get more money out of his refuse by feeding it to calves than he could by giving it to swine. If he expects to find his best market for calves among dairymen, then he should select bulls of some of the dairy breeds. If he expects to sell his calves by weight, he should secure a shorthorn bull or possibly Holstein. It would seldom result satisfactorily to permit the patrons of a factory to bring their calves there to be fed pro rata. Some one person can get more out of the refuse, and with better satisfaction to all concerned, if he has full control and a personal interest in how all the stock is cared for.

I have but little experience in feeding whey to calves. I have generally raised from ten to twenty heifers each year, starting them on new milk before the factory opened April 1. Thus mixing in a little sweet whey dipped from the vat, and after a few weeks giving them only whey, with a small allowance of grain. Give the whey only once a day when it is sweet. We have raised good calves in this way. My experience, however, has been only sufficient to show me some of the difficulties a person would encounter who attempted to dispose of all the whey to a lot of calves. Still, I believe it might be done with satisfaction and profit.

I have had more experience in feeding whey to swine, and, although the profits are small and uncertain, I doubt if any more satisfactory disposition can be made of the refuse of the factory. Many dairymen, I am aware, have very wild ideas of the profits derived from such a disposi-

tion of whey. I have sometimes heard them estimate it to be worth $10 per cow, and often $5 per cow. The fact is, the factoryman may be considered as pretty fortunate who has cleared a profit of $1 per cow for a series of years from whey fed to swine. Some years he will get much more, and some years he must give his time and trouble for nothing, and console himself with having had the company of his swine for a season. For instance, the present season has afforded no profit from feeding pigs in the ordinary way at the cheese factory. I find a balance of only $75 to my pork account this year, estimating that the manure has paid for their care. They cost six cents, live weight, in the Spring, and sold for six cents, dressed weight, in the Fall. At the prices we have to pay for grain in New York, we cannot afford to make pork at six cents a pound dressed. Had it not been for the whey I should have lost money. Last year was a much better one. Hogs cost us about eight cents live in the Spring, and sold for nine cents dressed in the Fall. It makes a difference whether we get nine cents or six cents for every pound of pork we make. In the one case there is a good margin for profit on the feed consumed, and in the other case nothing. Last year, with only a few more hogs than we had this year, our pork account netted nearly $500, or about $3 per cow, and this is about as well as we have been able to do for several years. There is one serious difficulty that we have had to contend with in our swine feeding business. We find we can get better hogs and more even lots by buying in Buffalo those raised in the West, but we have several times brought a very large amount of your hog cholera, which outgrew the swine. One Spring, out of a fine lot of 229 pigs, I lost over 90 within a month after getting them home, and the next season my loss was between fifty and sixty. Such experiences are not encouraging to the business. One year every factory or creamery in our county lost a large proportion of their hogs purchased in the West.

Col. H. C. Hoffman, who runs the largest creamery in our county, feeding annually about 200 hogs, informs me that the average profit from the refuse of his factory, taking losses into account, has not exceeded $1 per cow. He says he estimates that the refuse will just about double the weight of his hogs. For instance, his hogs weigh 110 pounds each on May 1 ; at the end of the season they would weigh 220 pounds as a result of feeding the refuse. What he makes them weigh more than this, he believes is due to their grain feed. Then, on this basis, with 200 hogs he would have made eleven tons of pork, live weight, from the refuse, worth this year say five cents a pound, or $100 a ton, or $1,100. He has the milk of 550 cows. This would give him a profit of $2 per cow. But, in order to fatten his pork well and make it fit for market, he feeds some grain, and when pork is worth only five cents, live, and he losses on the grain, he feeds to make the other hundred pounds, which secures his profit of two dollars on a cow. He probably has not received a net profit of one dollar per cow this year, and still, as far as losses from disease

and the condition of the weather are concerned, the season has been a very favorable one.

The Colonel thinks, and he is very right, that if we were so situated that we could lay in store hogs, and, after feeding them for five or six weeks, ship them off, we might largely increase our profits from the refuse. We would have to feed a little grain, but the hogs would make good return for it. Store hogs, wintered as they are in the West, almost exclusively on grain, will gain more pounds during the first six weeks than during the next twelve on the same amount of feed. Much of this more rapid gain, as I have hinted, comes from the condition and peculiar manner in which the hogs have been fed. A steer, if weighed in the Fall when taken from pasture, and again in the Spring, after a liberal feeding of hay and grain all Winter will not always show a gain in weight ; but if he has been at good pasture for five or six weeks, if he is weighed again, he will be found to have made wonderful gain. But there are other considerations in this problem of pig-feeding : A young animal will make more pounds in proportion to the feed consumed than an older one. An animal thin in flesh will also make more pounds than after it has become pretty well fattened. These are statements which farmers can test for themselves. If we can not get more per pound for a well-fatted steer or pig than when he is partially fatted, we are the losers on the latter feeding. Professor Miles, in his carefully-conducted experiments in pig-feeding at the Michigan Agricultural College, brought out these lessons very plainly. He had twelve pigs of different ages and different breeds, in twelve separate pens. All were fed exclusively on unbolted corn meal. Commenced August 30, and continued sixteen weeks. In two pens were two Essex pigs seven and a half months old. They weighed on August 30, 155 and 157½ pounds respectively. After the sixteen weeks feeding they weighed 316 and 318 respectively, gaining 160 and 160½ pounds. At the beginning of the eighth week, when these two pigs weighed 232 and 236 pounds, an Essex sow four years old was included in the experiment. She then weighed 438 pounds. In the nine weeks she ate 641¾ pounds of meal and gained 88 pounds in weight, requiring 7 28-100 pounds of meal for every pound of gain in live weight. The two young pigs consumed 455¾ pounds and 475¼ pounds, and gained 84 and 82 pounds, requiring 5 42-100 pounds and 5 79-100 pounds of meal for every pound of gain in live weight. The younger pigs ate more in proportion to their size and gained more pounds in proportion to feed consumed. The first four weeks that the four-year old Essex was feeding she made rapid gains, viz.:

	lbs.
First week	3½
Second week	41
Third week	17
Fourth week	19
Fifth week	4½

Gaining more in the second week than in the last four together. In the first four weeks after she began to gain she required four pounds of meal to produce one pound of gain. During the last four weeks 27½ pounds of meal to one pound of gain.

The young Essex during the first period of four weeks consumed 329 pounds of meal and gained 84½ pounds, requiring 3 87-100 pounds of meal for every pound of gain. During the last four weeks they consumed 411½ pounds and gained 58 pounds, requiring 7 9-100 pounds of meal to every pound gained. In every one of his twelve pens, including different breeds, ages and conditions, there was better returns for the feed during the first period of four weeks than the last four weeks, and in every pen but one there was a steady increase of amount of meal required to produce a pound of gain as the pigs approached ripeness.

The dairy farmer whose product is butter can take advantage of the lessons taught by Professor Miles' experiments. He should not think of feeding mature swine. Young pigs will do well on buttermilk and skim milk, and will make much more profitable use of such food than older swine. The dairyman who has a good home market can find advantage in selling his pig pork from time to time through the early Fall, generally getting better prices than if held until Winter. The butter dairyman who feeds the refuse of his dairy to swine should raise his own pigs. He should aim to have his sows farrow in March. I believe he should select large sows of the coarser breeds and a boar of the finer breeds. He will then have the advantage of prolific breeders and good nursers, and the pigs will be good feeders and mature early.

The refuse of the creamery, as generally managed, is worth more than that of the ordinary cheese factory. But at the creamery and cheese factory I believe it is not advisable to try to feed young pigs. Pigs from eight months to one year old at the beginning of the factory season are better suited to this under such conditions.

The practice in our Eastern factories is to buy Western hogs late in April or early in May. We prefer those that are not fleshy, but that have been so well cared for and fed that they have not been starved, but are healthy and vigorous. Such as we buy generally average about 110 to 120 pounds each.

About one hog to every two and a half cows will take the refuse. We feed a little grain during the whole season, using for the first months bran or red middlings. By judiciously feeding this the hogs may be induced to consume more whey and they will make far better use of it, for the bran supplies the elements in which the whey is most deficient. It is folly to suppose that any one plan is the best one for all factory men. Each man must study his own circumstances, taking into account the character of his feed, his facilities for feeding, the wants of his market,

etc. I have aimed only to give a few hints which I hope may be the means of calling forth those of still greater value from the intelligent and practical dairymen of this convention.

After which Mr. J. H. Reall, of New York, spoke as follows:

THE PAST, PRESENT AND FUTURE OF CHEESE AND BUTTER.

Whilst general business still languishes and the past year shows an increased number of mercantile and banking failures over the previous disastrous period, though many branches of manufacturing continue at a stand-still, labor remains unemployed, and general farming has not become remunerative, dairying, in the face of all this, has not only sustained its position as the most profitable of all agricultural pursuits, but it has, perhaps, upon the average, shown increased profits over other years. Considering the greater purchasing power of the national currency, both cheese and butter, at the prices now ruling for fine qualities, are dearer than ever before, while a larger production has resulted this year than usual in almost every section.

The receipts of cheese at New York in 1876 were 2,165,573; exports the same year, 1,817,955 boxes. Receipts in 1877, 2,443,922 boxes; exports the same year, 1,988,580 boxes. An increase in the receipts of 278,349 boxes, and in the exports of 170,625 boxes, and the home trade, at least in the interior, was also increased.

ENCOURAGING.

These are gratifying facts, and prove conclusively that we cannot produce too much cheese, unless we fail to keep up the standard of quality. Owing to the severity of the times, the domestic trade upon the seaboard, in 1877, was light, otherwise prices would be even higher than they are. If consumers of all classes understood that cheese at any price under double the cost of meat, was a third the cheaper while much more wholesome and nutritious, treble the quantity would be used in this country. Unfortunately, through avarice, we have always given the most inferior cheese we produce to the home trade, going so far as to practice this shortsighted policy with the very people who furnish the milk from which the cheese are made—hence it is only from sheer compulsion that our own nation eat any cheese at all. If we gave them the best, which, by the way, the foreign consumer gets as cheaply as our own people do the rejections, we should soon have such a demand for cheese in America, that we should not depend so largely upon the foreign trade for a market. Our people like fine, full-cream cheese as well as do our English cousins, and they should no longer be put off with skimmed and half-skimmed goods. If we give them a fine article, they will soon learn that cheese is a most digestible food, and that it is a want of quality which makes the kind they have been used to eating lie like grindstones upon their stomachs.

SKIMMING.

I have not changed my views upon the question of skimming from years ago, when I said it was impolitic to make skimmed cheese, and that the practice would result in permanent injury to the trade, but the greed of patrons and the verdancy of the American consumer has kept it in vogue, while the average country buyer has too generally made no discrimination between the factories making the two kinds. This has done more to encourage the manufacture of skimmed cheese than anything else. I know many factorymen who have made honest efforts to break up the system by beginning on full-cream cheese themselves, or changing from skimming to that plan, but when they came to sell their products they met with no encouragement from the buyer, who paid only the same price as for the inferior kind, and hence they were compelled to return to their false gods out of self-defense. The manfacturers, who, as a class, are insufficiently paid, are compelled to take advantage of the smallest point that will increase their dividend in order to retain their meager patronage. Dairymen are to blame for many of the evils that have crept into the manufacture of cheese. Whilst the pennies are important, some dairymen value them too highly, often to the loss of dollars. I know that the profits of all branches of farming are very light, and that it is only by unceasing labor and untiring watchfulness that the husbandman is enabled to live and accumulate something for himself and loved ones. I know that both the farmer and his wife are compelled to labor from early dawn until the sun has sunk in the west, and to practice the severest self-denial in order to make both ends meet. If he succeeds in accumulating something for the future, it is only after years of unremitting labor. The rapid accumulation of wealth by the fortunate merchant, manufacturer, and professional man, is beyond his power. He has few of life's comfort's much less of its luxuries. The pleasures of the city folk and their social advantages are unknown to him. Even the thousand comforts enjoyed by those of moderate means in the city are denied the average farmer, and yet all classes are primarily indebted to the toiling husbandman for all they have. I can appreciate the hardships of the pioneers who turned a wilderness into a paradise, and God bless them for their noble endurance and self-sacrifice. They did more for the advancement of our country than all others besides. Their sufferings, their toil, and their life-service has given us a land of unequaled advantages. Though all these things are true, the farmer should not depreciate the quality of his product in the hope of realizing larger results. The grain producer aims to raise the best corn, the best oats, and the best wheat. The stock-raiser spares no effort to produce the best cattle and the finest horses. The fruit-grower cultivates the choicest varieties of the apple, peach and pear. Each strives for excellence, and why? Simply because the best, besides yielding as much or more than the inferior article, brings the largest price. This is a universal law, and though

there has been a time when the manufacture of skimmed cheese was the most profitable, it is going by. I grant that there are instances in which the skimmed cheese of one factory is of better quality than the full-cream product of another, but the reason is the former was made skillfully and the other was not. There are too many poor cheese-makers and too few good ones, and the reason is that the importance of making cheese right is not properly appreciated. Learners do not serve as apprentices long enough ; too generally persons receive charge of factories after but a few months' experience at the vat. This should never be allowed. Few trades are more difficult to learn, and none require more skill in their successful execution. A higher class of cheese-makers is greatly needed, but in many districts the price of manufacturing has been reduced so low that skilled workmen are not encouraged. For a few dollars less a month, or a fraction per hundred pounds difference, incompetent hands are employed, and hundreds of dollars are lost to the patrons thereby.

SELLING.

There is great objection to the manner in which the selling is managed in certain localities. Instead of a committee of three, only one man should do the selling for a factory. This plan is followed in Pennsylvania, New York, Illinois and Wisconsin, with excellent results. Where the milk is made up on shares the most suitable person is the manufacturer, who is constantly informed, through circulars and correspondence, of all the markets. Coming daily in contact with buyers and having made the cheese he knows what they are worth and when he gets their value. If he has not sufficient brains to manage the sale of his product he is not fit to make cheese. It requires intelligence to make cheese as well as to sell it.

THE FREEMAN PROCESS.

The process of manufacturing cheese, originated by Mr. Henry O. Freeman, is attracting much attention and is not without merit. The milk is set in the usual way, where creamery butter is made, at about 50 degrees temperature, and held from twenty-four to thirty-six hours, when it is skimmed, heated to a temperature of 92 degrees, and sweet, clean beef suet raised to the same temperature is substituted for the cream, and sufficient rennet is used to cause coagulation in from ten to twelve minutes. Every particle of the cream is taken from the milk that it is possible to obtain, and the fat is used to enrich the then almost useless curd. The product is a good, wholesome article of food, and I regard the process as one of great value to the public, since a larger supply of fine butter is imperatively needed, while the milk would otherwise be worthless (for when made into cheese it has only a commercial value of from two to four cents per pound, and none as food), it is by this process converted into a palatable and nutritious cheese, worth double to quadruple the price it would otherwise command. The butter produced by this plan is solely from cream, and has, throughout, brought

the highest prices in the New York market. Great pains is taken in the manufacture of the article. The product meets with favor both in this country and in Europe, but is mainly exported. As there is no adulteration or deception practiced. I approve the system, and favor radical skimming, if skimming must be done, but I give preference at all times to full cream cheese. The owners of this process do not claim to make as good an article as fine full cream cheese, but to greatly enhance the value of skimmed milk. Thus far I endorse them, but only after carefully investigating the subject, and visiting their factories, which are models it would be well for many to copy after.

RICH, MILD CHEESE DEMANDED.

It is well for producers of cheese to note the growing demand for fresh goods as well as for superior quality. Cheese are wanted mild, but rich, and unless factories have facilities for holding their early make possessed by very few, the sooner they market their cheese, after it is cured, the better. Greatly improved curing houses over those now generally in use are much needed. Already many have realized the importance of this, and have lined or plastered parts of their factories.

Close made cheese are growing in favor with the home trade, while the foreign consumer has always demanded them, and I trust, sooner or later, all manufacturers will be more friendly to acid.

BUTTER.

The butter trade in general was not encouraging last year, though that produced upon the creamery system did not rule unreasonably low. Worth from twenty to twenty-five cents per pound during the Summer, and now commanding thirty-five to forty, there is certainly no cause of complaint among producers of this kind, but dairy butter has done badly for several reasons: (1). The general taste of the public has become so well cultivated that all classes want a fine article. (2). Butter being more or less of a luxury, those in reduced circumstances have largely denied themselves its use. (3). The large quantity of imitation butter that was manufactured during the year took the place of much of the low grade natural butter.

THE REMEDY.

To meet the first requirement, we must produce more fine butter and market it while fresh, and by increased attention to Winter dairying, which has proved the most profitable branch, be prepared to supply it fresh at all seasons of the year. The preference for fresh butter has become so great that in the Winter, when fine stock cannot be had sufficient for all, the masses take late made butter, however characterless, in preference to the finest early made New York dairies, which formerly commanded much the highest price in Winter, of any kind. The time when New York dairy butter would bring from five to fifteen cents per pound more in the Winter than in the Summer when made, has gone by, and instead of yielding a profit by holding, it generally produces a

loss. The time to market butter, therefore, has come to be when it is fresh. Large quanties of fine butter were exported to England this Summer, and it is demonstrated that she will take any quantity of fine butter, as well as cheese, if the price be moderate.

The creamery system of making butter must supplant the dairy plan to a very large extent, and the result will be a great saving in waste and labor to the milk producer, besides yielding him a larger return.

The price of creamery butter last year will probably average thirty cents per pound; New York dairy, say twenty cents, and all dairy not over fifteen, for the poor farmer of the far Western States only realized ten to twelve cents for his product throughout the Summer, and then the buyer worked without profit. It will thus be seen that there is a large difference in price in favor of creamery butter; but, beyond all this, is the fact that all classes of our people should have the opportunity to obtain first-class food of all kinds at reasonable prices. Returning prosperity will secure a larger home consumption. The oleomargarine plague will work its own cure. The law of New York State compelling the article to be branded with its true name is now being rigidly enforced by the American Exchange of New York City, through its able and energetic Secretary, T. Mortimer Seaver, Esq., who has done more to protect the interests of the producer and consumer in this matter than any man in the country. Having their eyes once open to this greatest of American frauds, the people will not henceforth be hoodwinked with an article of food that is liable to be dog fat or refuse from the slaughter house, especially when the natural article can be obtained at the same price.

The predictions as to the growth and extension of the dairy industry are being largely fulfilled, and the future is one of great promise. Its followers have, as a class, prospered above all others. The finest parts of our country are those devoted to dairying. The land is the best improved of any, and its thrifty cultivators deserve their well-earned success. The natural pursuit of man, dairying, affords him both physical and intellectual food. No class of men think more and experiment more or discuss more. These conventions attest this, and they should be still more largely encouraged. Not only must we sustain the national and State organizations, but increase the local societies. They have been of vast benefit, not only to their members, but to the entire dairy community, and excellent results may yet be realized from them. Increased support of the dairy press, which has done so much to forward the great cause, is your interest and your duty.

DAIRY FAIRS.

An important feature of the industry last year was the successful inauguration of dairy fairs. Besides the large exhibits of butter and cheese that were made at the New York, Wisconsin and Illinois State Fairs, and at the annual St. Louis Exposition, which has become noted

for superior displays of these articles, distinctive dairy fairs were held first at Meadville, Penn., under the auspices of the Pennsylvania Dairymen's Association, and second at Chicago, under the combined auspices of the Northwestern Dairymen's Association and the National Butter, Cheese and Egg Association. The Meadville Fair was a most creditable one, and the Chicago Exhibition was of surpassing excellence. The display of cheese and butter represented every section; and while the former was very meritorious, the latter exhibit is pronounced by all to have been the finest ever made. The particulars of this fair are doubtless familiar to all, as they have been fully published. Largely attended meetings were held at the same time for the discussion of dairy matters, and addressed by leading men of the trade. These fairs are of vast utility, and should be largely encouraged. Having been successfully inaugurated, a national one should be held every year at some central point. Through their instrumentality cheese may be popularized as by no other means, both at home and abroad. I hope to see a National Dairy Fair held in New York next Autumn, and trust this association will take action in the matter at the present session.

DAIRY FAIRS IN GREAT BRITAIN.

Great Britain has for many years given much attention to dairy fairs, and is now displaying increased interest in the subject, having held two very important ones last year, one at Frome and the other in London. Frome is in the County of Somerset, the great Cheddar cheese district of England. It is a quaint old town, nestling among the hills. The fair was established there seven years ago, and when I visited the comely village in '74, a commodious building had just been completed especially for the accommodation of the annual dairy fair, so much interest did the dairymen and citizens take in the matter. The fair had just closed, but I remember with great pleasure the privilege I enjoyed while there of addressing a meeting of leading English dairymen on the subject of dairying in America, and of forming some very pleasant acquaintances. Each year since some kind friend sends me an account of their annual fair. This year it was held the last of September. The town was beautifully decorated, three large arches adorning the entrance ways to the market place, and four others gracing different parts of the village. "Banners, wreaths of flowers, devices of different kinds and mottos were all called into requisition." Indeed the whole town was gorgeously arrayed in the brightest holiday costume, the banks, public buildings and private residences being decorated also. A brass band discoursed music throughout the day. Two hundred and sixty-six lots of cheese and eighty-one lots of butter were exhibited, and between two hundred and thirty and two hundred and forty tons of cheese were placed on sale. Dairy implements and farm machinery were also exhibited. The receipts for admission amounted to about seven hundred dollars, and the visitors numbered about four thousand. The prizes aggregated over $1,200. A

grand banquet was held in the evening of the exhibition, and thus the festival of the occasion closed.

THE LONDON FAIR.

The second English dairy fair of the year was held in London in October, under the auspices of the British Dairy Farmers' Association—a new organization, whose Secretary is Henry F. Moore, Esq., of the *London Agricultural Gazette*, a gentleman who has labored assiduously to promote the dairy interests of Great Britain, and who takes a deep interest in American Dairying. The fair was a great success. The large building in which it was held was filled with samples of cheese, butter, dairy implements, goats, mules, donkeys, and poultry. It was a national fair, and all sections participated in the display, our own country sending cheese which received prizes. A noteworthy feature was the exhibition by Thomas Nuttall, Esq., of Beeby, Leicestershire, of 4,000 Stilton cheese, in four great pyramids of 1,000 each. The *Agricultural Gazette* describes this as a marvelous display, and estimates the value at $5,000.

Both the practice of dairying and dairy fairs receive the attention and support of the titled classes in Great Britain. At the Frome banquet the Duke of Somerset, who is President of the Association, presided, and lords and Members of Parliament participated. Her distinguished men take a pride in dairying and agricultural matters. They realize that there is no nobler calling, and that intellect can be as advantageously employed in that which our own public men too generally regard as beneath their attention. The Prince of Wales prides himself on having the finest dairy in Great Britain. Some day our people will realize that dairy meetings and dairy fairs and general agriculture affords the most interesting subject for thought and discussion. That great and good man, Horace Greeley, understood this, and he will long be remembered as the friend of the farmer. We need more like Mr. Greeley, and the distinguished gentleman who presides over this Association, America's leading citizen, Horatio Seymour, whose name is known and loved in every home in America, and its possessor is an ornament to our country. We need more Arnolds, Williards, Greenes, Curtises, McGlincys, Hoards, and Wicksons ; men who have done everything for the advancement of this great and growing industry. The press has done its full duty toward it, and some day the world will appreciate its importance in the great economy of nature, and our leading men will be glad to be known as the promoters of dairying.

In the Spring a large dairy fair was held in Hamburg, Germany, of which Henry F. Moore, Esq., said at the Frome banquet :

"He attended the dairy show at Hamburg, and there saw some cheese exhibited by Russians who years before were sent over to Cheshire and Derbyshire by the Czar to see the systems of cheese-making here. After one season in England they returned to Russia, and last year they sent a

large quantity of cheese, made upon the Cheshire principle, to the Hamburg show. A thousand pounds' worth of the cheese was bought by a dealer at 72s. per cwt. He believed that foreign competition in cheese-making had produced a higher average quality than in this country."

A new era of prosperity seems to be dawning upon our country, and soon our factories and mills will be in operation again and suffering labor employed. Business begins to show signs of revival, and altogether we have reason to expect a future of prosperity rarely equaled. It will be enduring because moderate. By misfortune we have learned the evil of overdoing things. We are once more a reunited people, and no efforts of the political tricksters, who are a curse to the country, should be suffered to interfere. It is the duty of every citizen to uphold the President in his patriotic course, and the man who, from factious opposition, stands in the way, is an enemy to the public weal. The North and South, East and West, have a common destiny, and each should aid the other in its development and progress. Congress will fail in its duty if it does not encourage this principle and aid in the development of our great resources, by providing every proper facility for the largest exchange of products between the different sections. Greater facilities of intercourse with the South and Southwest are needed. Those sections deserve well at the hands of Congress. The South is entitled to support in her great railroad scheme, and its completion will benefit every industry of the country in a wonderful degree.

At the conclusion of Mr. Real's address the Secretary read, by the request of this Convention, a proposed act requiring oleomargarine to be stamped, and a motion was introduced recommending the dairymen of Ohio to petition the Legislature to pass a similar act.

On motion, the discussion of this subject was postponed till 10 o'clock on the following day.

Mr. C. W. Horr, Esq., offered the following resolution, which was adopted:

Resolved, That inasmuch as the product of our dairies is shipped to England in large quantities, to the great advantage of the dairy interest, and inasmuch as we use a large amount of English salt in the manufacture of cheese and butter, as an act of comity and justice we recommend our National Congress to repeal the present tariff on salt.

Francis D. Moulton: I am in entire sympathy with the motion that has just been read. It is only a few years ago when there was but one house on the site where Syracuse now stands. Now, her salt manufactures cover acres and acres of property, and large quantities are imported, to supply the demand, and on this a tax of fifty-four cents in gold is paid on every sack, or $2.69 in gold per ton. This heavy tax is paid by the consumers. The people object to this tariff. What we want is liberal legislation on this question in connection with our free canals.

DAIRY SALT.

The following paper, on the above subject, was then read by Francis D. Moulton, Esq., of New York. He said,

Mr. Chairman and Gentlemen:

It is not surprising that many of the ablest writers and most thoughtful men of the country occupy themselves to-day in undertaking to determine how to enhance the value of its dairy product, when we are brought face to face with the fact that this product equals annually in value at least six hundred and thirty millions of dollars, and the subject will continue to be of great interest until that day, in the millenium, perhaps, when the wise man will speak who shall have mastered all the questions that agriculture involves, from the turning of the furrow to the successful marketing and consumption of the earth's product. The reasons that justify the wisest among us in considering all questions that relate to the interests before us, sufficiently justify even the humblest in contributing any and all facts within his knowledge or observation, for the same beneficent purpose.

One of these questions is—which is the best salt to use for the manufacture of butter and cheese, in order to secure the best quality and realize the highest prices for these articles?—and as it is now agitating all interested, from the farmers and makers to the dealers and consumers, with your indulgence I will give the subject a few moment's attention.

It has been said by a chemist in the employ of two Dairy Salt Companies, at Syracuse, that "prejudice that is fostered by certain interested parties, has more to do with the question than the quality of the butter salted." If this criticism is just, and Prof. Francis E. Englehart ought to know, for Syracuse has furnished to many conventions gentlemen pre-eminent in their advocacy of Onondaga salt, I shall at least endeavor to make myself an exception to it by asking you to pay attention, not so much to my opinion, as to the judgment of those whose experience and integrity entitle them to credit. I find, at the threshold of this question, two statements sufficient to convince any reasonable man that the interests involved are too important to be treated either from the standpoint of prejudice or personal interest.

1st. The production of butter is estimated at one thousand millions of pounds, and the production of cheese at about three hundred million pounds per annum, at an aggregate value of about three hundred millions of dollars, and it has been asserted by one of the best informed men in the trade, Mr. M. Folsom, who was Chairman of the Committee appointed by the Butter and Cheese Exchange of New York to investigate and determine which salt was best to use for making butter, that the larger portion of the make of butter and cheese has been spoiled by the use of improperly manufactured salt.

I am of the opinion that, notwithstanding the importance of the ques-

tion, in view of the enormous money value involved, its solution is quite simple if the makers of butter and cheese will give heed to a few facts which I shall present for their consideration.

I may be pardoned, for the present, at least, if I leave the scientific department of the salt question in the tangle which I shall not, in this brief discussion, attempt to unravel, for I find, according to one authority (Schleiden), that chemically pure salt will not preserve butter, and, according to another, who advocates the use of a certain brand, that on analysis he finds "a quantity of impurity so small that a homeopathic physician would almost doubt its effect, even if it was one of his most potent remedies." "Who shall decide when doctors disagree?" My answer is, those who have had occasion for years to judge of the effects of the use of any particular brand or brands of salt in the making of butter and cheese, whether as dealers in salt or as dealers in butter and cheese, or as manufacturers of these articles.

A few years ago Orange County was celebrated for the high quality of its butter, which always brought the highest market price. What salt did the butter-makers of Orange County use? They used the Ashton Factory Filled Salt, and although attempts were made to introduce other brands, as is the case at present, to the deterioration of the product, practical experiment demonstrated that Ashton's Factory Filled was the best, and the following letters, which we find in the report of the National Butter, Cheese and Egg Association, from parties whose responsibility, experience and integrity are well known, attest its excellence:

NEWBURGH, N. Y., Jan. 10, 1877.

GENTLEMEN: It is our opinion that Ashton's Factory Filled Salt is the best salt imported into the United States, and we have no doubt that the excellence of Orange County Butter was and is maintained through the almost exclusive use of this brand of salt.

Very truly yours, HOMER RAMSDELL & Co.

NEWBURGH, Jan. 13, 1877.

GENTLEMEN: Your inquiry with reference to salt used for butter purposes is at hand. On account of our experience with Ashton's and other brands of Liverpool salt, we should not consider it right or even prudent to recommend any brand except Ashton's Factory Filled for butter manufacture, because in weight and quality it never varies.

Very truly yours, W. O. MAILLER & Co.

NEWBURGH, Jan. 15, 1877.

GENTLEMEN: I have not the slightest doubt that the superior quality of Orange County butter was and is due to the use of Ashton's Factory Filled Salt, which I consider the best and only safe salt to use in butter-making, and I cannot recommend any other brand. Several years ago I tried to introduce domestic salt against Ashton's, but complaints against butter made with it compelled me to abandon the attempt, and go back to Ashton's.

Yours truly, E. T. SKIDMORE.

NEW YORK, March 1, 1877.

GENTLEMEN: Yours of the 25th ult., inquiring which, in my opinion, is the best among the brands of salt for the manufacture of butter and cheese, referring also to my experience with foreign and domestic salt, is

before me. My opinion is that Ashton's Factory Filled Salt is the safest brand to use for dairy and household purposes. This opinion is based on my commercial experience in this country, and my observation of the manufacture of salt in England.

Very truly yours, SAMUEL R. ST. JOHN.

NEW YORK, March 1, 1877.

GENTLEMEN: I beg to say, in reply to yours of the 26th ult., that in my opinion Ashton's Factory Filled Salt is the best salt imported into this country. Farmers and manufacturers of butter can use it without risk, on account of its uniform texture and quality. I have not heard a complaint from any source in 25 years of experience in the salt business against its weight and quality.

Yours truly, FRANKLIN WOODRUFF.

During the year 1875, the question, which salt was best to use for butter, was presented for the consideration of the Butter and Cheese Exchange of New York City, and a committee was appointed to investigate and determine it. The letter of Mr. M. Folsom, the chairman of the committee, I quote in full, because it bears directly and fairly upon the subject before us.

NEW YORK, Oct. 26, 1877.

GENTLEMEN: In 1875 the New York Butter and Cheese Exchange appointed a committee of which I was chairman, to investigate and determine which salt was best to use for making butter. Samples were selected of Onondaga, Higgin's, and Ashton's, with the understanding that they should be used separately and the butter forwarded to New York to be examined by a committee of experts, each package to be numbered and a record kept, which was to be secret until the final meeting of the committee. After receipt of the butter I called the committee together, and upon careful examination they each separately selected which butter they considered the best, and the butter so selected proved to be that salted with "Ashton's Factory Filled Salt." Therefore, the committee unanimously reported "Ashton's Factory Filled Salt" as being the best salt to use in the making of butter. Since then, the committee, together with the experts, have signed a recommendation favoring the Ashton Salt as the best and virtually the only salt to use in butter and cheese.

Yours truly,

(Signed) M. FOLSOM.

I will also read to you several letters, valuable because they give the experience of able men, who are large and careful manufacturers of butter and cheese, and of others who have for years been well known throughout the country as dealers in these articles. The first is from Mr. Henry O. Freeman, of Sherburne, Chenango Co., N. Y.

SHERBURNE, Chenango Co., May 24, 1877.

For the past fifteen years I have allowed no other salt than Ashton's Factory Filled used in the butter department of creameries under my charge, except when forced to, by being out of it, and unable to secure it in time. Upon these occasions I have tried either the Onondaga, or Higgin's brands, neither of which gave satisfaction; the latter falling far short of the peculiar "Ashton" qualities possessed by that salt for making fine butter. For the past fifteen years my make of creamery butter has stood second to none received in New York City, running in a season to 300,000 pounds. I consider its quality, in a measure, due to the persistent use of "Ashton's Salt in its manufacture."

Respectfully, HENRY O. FREEMAN.

The second is from a firm who, after careful experiment, have reached a conclusion which is simply and forcibly stated:

NEWARK, Dec. 14, 1877.

DEAR SIRS: After using several different brands of English and American salt, we have finally settled on Ashton's and use no other at our creameries, near Rome and Utica, New York, and have been doing so for the past year. Yours, &c.,

WILKINSON, GADDIS & CO.

The third is from Wisconsin, and the suggestion of the writer with regard to the repeal of the tariff on salt is of too much importance to escape your attention:

OFFICE OF THE FULTON CREAMERY,
EDGERTON, Wis., Dec. 27, 1877.

DEAR SIR: I thought it best to drop you a line on the salt question. I have now been using Ashton's Salt entirely, in preference to all other kinds, in my creamery. I have tried different brands through the season, and find my butter gives a good deal better satisfaction since leaving off all other kinds of salt. We have made since May 1, 1877, thirty-six thousand pounds of butter. I do not make any cheese, and I have made several tests with different brands of salt, but shall use no other than the pure Ashton's for the future, as I find we can make a better quality of butter from it. You will please excuse my long letter on this subject, but I think it is a great object, which must be made known to the dairymen of the Northwest, and I hope you will make every exertion to remove the duty from the same. Respectfully yours,

JAMES CLOUGH.

The fourth is from Wellington, Ohio, and it loses none of its force from brevity:

WELLINGTON, Ohio, Jan. 3, 1878.

DEAR SIR: We use only Ashton Salt, and will use no other. Higgin's Salt does not give satisfaction in this section.

G. W. CROZIER & CO.

The fifth is from Mr. P. E. Sanford, of Warwick, New York, and relates to a very important part of the question before us. I introduce this letter because I find that the question of which salt is best to use for stock is commanding the attention of herd owners, on account of a belief that the quality of the salt has a relation to the quality and quantity of milk which a cow will give:

NEW YORK, Jan. 5, 1878.

GENTLEMEN: Your inquiry with reference to salt used in feeding our stock, for the production of the best quality and quantity of milk, is before us. We feed only the Ahston Factory Filled Salt to our cows, because we are convinced, from experience with various brands of salt, that this brand of salt is the best, being almost immediately soluble, and leaving no sediment. We believe that the best salt is as essential to cows for the best milk as it is to butter-makers for the best butter.

P. E. SANFORD, Warwick, N. Y.

The sixth and last paper to which I invite your attention, needs no emphasis from any word of mine:

To Makers of Butter and Cheese:

NEW YORK, Jan. 5, 1878.

The Butter and Cheese product of the country has been injured by the use of salt not suited to its manufacture, and believing that the value of

these articles will be greatly enhanced by the use of Ashton's Factory Filled Salt, we earnestly advise its use in the interest of Manufacturers, Dealers and Consumers.

HUNTER, WALTON & Co., 164 & 166 Chambers St.
MACKENZIE, NEWMAN & Co., 92 Warren St.
SMITH & UNDERHILL, 74 Broad St.
R. BAMBER & Co., 77 Broad St.
PORTER & WETMORE, 69 Broad St.
JOYCE & BILLINGS, 102 Broad St.
BELT & CILLEY, 154 Chambers St.
M. FOLSOM, 70 Warren St.
M. D. CONKLING, 161 Chambers St.
P. I. RONK, SON & Co., 155 Chambers St.
N. D. HARE & Co., 299 Washington St.
W. WINDSOR, 299 Washington St.
J. N. SEYMOUR & Co., 159 Chambers St.
HENRY WELSH, 345 Washington St.
And many others.

I think I have offered for the present, at least, sufficient evidence to show that manufacturers of butter and cheese can make no mistake against their own interests by using Ashton's Factory Filled Salt, if they take care to purchase the genuine brand from responsible merchants, and I utter this caution because it is a fact that the brand has been counterfeited, and that salt inferior in quality has been put into the empty sacks, purchased for the purpose of making money by fraud; but I am of the opinion that complaint on this account will be less frequent hereafter, as several of the parties to this fraudulent business have been successfully prosecuted.

During the past year the importation of the ordinary brands of salt has been very great, and prices have ruled low, so that many dealers have been induced to handle them, and in instances that I know of, representations unwarranted, and untrue with regard to their quality, have been made in order to effect sales. In many cases a consideration much larger than the ordinary or average profit on salt has been offered (and especially to the dealers in the country who supply the dairy districts), to induce parties to market certain brands, representing them as good as the best for the making of butter and cheese.

The difference in price between Ashton's Factory Filled Salt and any of the other brands is too small for consideration when compared to the value of the product into which they enter; and the injury to the reputations of manufacturers of butter and cheese, as well as the great loss in money on their product, is so serious a matter that experiments in salt, at their own expense, to save not over a cent or two on one hundred pounds of cheese, and a very small fraction of a cent on a pound of butter, are, to say the least, imprudent and unwise.

The manufacturers of the best butter and cheese use Ashton's Factory Filled Salt, and the most responsible merchants of New York, Philadelphia, Boston and Baltimore, who buy and sell, or handle on commission,

the dairy product of the country, have recommended its use over their own signatures.

The attempt to introduce other brands than Ashton's Factory Filled, representing them to be just as good for dairy purposes, has been made during almost every year that I have known of the salt business, and many efforts have been made to injure it by using the name Ashton to cover the sale of salt in barrels totally unfit for butter and cheese-making. There was a time, many years ago, when the attempt seemed to promise success. Captain Hunter, now of the firm of Hunter, Walton & Co., told me, a few days since, that many years ago he and his partners thought that one brand of salt was just as good as another for the preservation of butter, and they were not particular which brand they purchased for a standing cask of brine that they kept for use in their business, until they found a deposit five or six inches deep in the bottom as hard as a stone, so that they were obliged to destroy the cask to remove it. Captain Hunter says that they had a new cask made in which, for sixteen years, they have used nothing else than Ashton's Factory Filled Salt, and that during all that time there has been no deposit of sediment and that the brine has been perfectly clean, clear and sweet.

Captain Hunter is also my authority, and I can have no higher, for making this further statement: During the past season he found that the butter product of Delaware and Chenango Counties, of New York, had greatly deteriorated in quality, and that, on inquiry into the cause, he found that certain manufacturers, whose product he had handled, and which had always been of the best quality, and in which Ashton's Salt had been exclusively used, had been experimenting with other brands.

One word more and I have done. It is with reference to the care used in the manufacture of Ashton's Salt. With every care possible used in its manufacture, fully 25 per cent. of the salt is regarded as unfit to go into bags; whereas, every other maker sends away the whole product of his boiling pans, be it good or bad. In the manufacture of salt, the purity of the brine is of prime importance. Many of the Cheshire brines contain large quantities of earthy matter, and all of them contain lime in a greater or less degree. The Ashton brine is of full strength and freed from gross impurities by passing through two settling pits, or reservoirs, before passing into the pans. Before the brine boils, and previous to any salt being formed, any remaining impurities in the brine are removed by a process peculiar to and known only to the manufacturers of Ashton Salt. Some of them are thrown to the surface of the pan and skimmed off, while others are precipitated to the bottom of the pan, and form what are known as "pan scales." When salt is formed in the pans it is not allowed to remain there, but is removed frequently and placed in moulds, and thus uniformity of grain is secured. Any salt not up to the standard is put aside, and the workmen (boilers) suffer by being paid at a lower rate

for the salt they have spoiled. The Ashton stoves are unique, and in them the heat is so distributed as to insure an equal temperature. The salt is placed in them and allowed to remain till every particle of moisture is expelled. Everything done in this department is such as long experience has taught to be most conducive to the proper preparation of salt, and of its being thoroughly dried in every part. When the salt is thoroughly dried in the stoves, it is removed to large rooms, kept at a temperature as hot as will permit of men working. Here every lump is carefully broken *by hand*, and any particles of pan scales or other foreign matter which escaped the notice of the *boilers* or *stovers* are carefully picked out. Any lump of salt found not up to the standard is rejected, and only such as are suitable are broken up. The broken salt is then stored in this warm, dry and perfectly clean room, until it is wanted for shipment, when it is carefully *filled by hand*, and the salt being thus again passed in review, any scale that escaped the "breakers" is picked out. No machinery is used, because any impurity in the lump cannot be detected where machinery is used, as the lump is passed into the machine, crushed and sacked, the attendant having no opportunity of seeing the condition of the salt. The outside of a lump may appear all right, yet, through the carelessness of the boiler, the inside may contain large quantities of pan scale. Should a boiler neglect his pan by allowing it to cease to boil and then fire up and make it boil, the sudden expansion of the bottom of the pan will detach large quantities of "pan scale," which will find their way into the lumps, and their detection is impossible where machinery is used.

The Ashton's Salt is made by men who have passed their whole lifetime at the works, and whose steadiness has in a great measure secured for the salt its great reputation. The methods of the manufacture are handed down from father to son, and thus perfect regularity is secured at a cost considerably over what is paid by other manufacturers. No other manufacturers of salt pay as much for the work done, and consequently none have such a staff of men to whom constant employment at good wages is insured. Hence their carefulness. By the use of machinery the production of Ashton's Salt could be cheapened, but its quality would be deteriorated. The bags are of the best quality and in every department of the works the most scrupulous cleanliness is enforced. No manufacturers of salt except Ashton's confine themselves to the manufacture of one description of salt. For more than half a century they have devoted their entire time and attention to a salt suitable for the manufacture of butter and cheese, and have succeeded in producing an article which, upon its own merits, defies competition. The isolated position of the works affords an opportunity for cleanliness possessed by no other makers of salt, whose works are, without an exception, surrounded by other works, and are pervaded by smoke and soot.

At the conclusion of Mr. Moulton's address, a member said :

"Mr. Moulton, I would like to know whether you are the agent of any particular brands of salt?"

Mr. MOULTON : I am the distributing agent of Marshall's, Evans, and Ashton's Factory Filled Salt. I am willing to guarantee Marshall's and Evans' salt as good for every purpose as any other brand, except Ashton's, now, or heretofore, offered to consumers. I have been honored by the privilege of addressing this convention, and have spoken only with reference to the interests of the great industry it so fully represents.

Prof. F. E. ENGLEHARDT, of Syracuse, then followed with an address on the same subject :

SALT—ITS HISTORY, OCCURRENCE, USES AND MANUFACTURE.

He spoke as follows :

The use of salt as a condiment must be very ancient indeed, since we have no historical record either of its discovery or its first use by man.

The necessity of salt for the animal body, is clearly seen in the instinctive desire of the wild beasts, especially of those that live on vegetable food, for salt, hence they frequent the so-called salt licks, and it is very probable that our earliest ancestors became thus first acquainted with salt.

Both constituents of salt (salt being a chemical compound of the metal sodium and a greenish gas called chlorine), sodium and chlorine form parts of the elements of the animal body, and are usually not yielded in ordinary food (except it be flesh food) in sufficient quantities, hence the natural craving for more. Dr. Ed. Smith, of England, says : That "the immediate use of salt appears to stimulate the sense of taste and to increase the flow of saliva, but its preserving action is due to its power to attract moisture, by which it tends to harden whatever moist substance is brought in contact with it, and when it has obtained moisture it becomes soft and loses its flavor. There is no other compound of chlorine which effects both of these purposes or could supplant common salt."

The first mention we have of salt in historical times, is in the description of the destruction of Sodom and Gomorrah. Under the Jewish dispensation the use of salt was necessary for all sacrifices in the temple. In Leviticus it is called a preservative. Christ said to His disciples : "Ye are the salt of the earth." It is also used in the Bible as an emblem of eternity, wisdom, and reconciliation. Elisha employed it to sweeten the fountains of Jericho, and the Israelites rubbed their new-born children with salt. In no less esteem was salt held by the rest of the world. Pythagoras called it "a substance dear to the gods and the symbol of justice." Homer, divine, and Plutarch "a symbol of the soul, the spice of all spices." Plinius remarks : "Verily, without salt it is impossible for a human being to live," and Horace that "bread and salt best satisfy a barking stomach."

In the Orient the eating of bread and salt together was as much as making the most secret contract, and even now the Arabian princes make their treaties by sprinkling salt over bread, exclaiming, "Peace! I am your friend's friend and your enemies' enemy."

Dschellar-eddin sent to the Chazars, who had united with his enemies, bread and salt to remind them of their old contract, and at once they returned to him. The Greek poet, Archilocus, says: "Broken have you the solemn oath, you have violated salt and table." Bread and salt were, and still are, tokens of hospitality with the Bedouins and Druses.

Jacob-ben-Laith, while breaking into a house over night, came against a hard substance, which he took up and tasted, and when he found it was salt, he left the place at once, without taking with him the already secured booty, because he had tasted salt in the house. Salt also served as money. Thus Marco Polo relates of the province of Kaindu, that the smallest piece of money is salt. The brine is evaporated in small pans and formed into cakes, which are dried on hot bricks and stamped with the Emperor's seal; 80 pieces of it are valued at one-half ounce of gold, and in the mountains 40 of them are equal to the same. A Duke of Bavaria offered the heirs of Amerbath, in Basel, 2,000 tons of salt for a Christ by Holbem.

Southeast of Tadshura (Africa) is the salt lake Ossal, where the salt is made in the shape of grindstones and sent to the Abyssinians, who call them Amoles, and carry them wherever they go, offering them to their friends, when meeting, to lick.

Salt also played a great roll in the superstition of our ancestors. Thus it was believed that salt, when thrown down the back of a witch, would prevent her from rising, and destroy her powers. Salt was considered antagonistic to the devil; he did not eat salt, hence the custom, when young children were abandoned by poor parents, they put a little salt next to the child to prevent the devil having any power over it; for the same purpose, a handful of salt was thrown into the fire when a person was in the agony of death, and placed on the body after being laid out. Salting a new house, or a house being entered by a new tenant, for luck.

That the use of salt, which is the only mineral substance we partake of (an exception is some uncivilized tribes such as the earth-eating Ottomacks and those Norwegians who bake rock meal, a species of carbonate of lime, into their bread) must have been introduced gradually, is evident, first, from the fact that there were people living in historical times who did not use salt. Homer sings, therefore, "travel till you reach those mortals who know the ocean not, and never partake of salt-seasoned food." Secondly, salt, especially rock salt, and that which covered extensive plains as a thin crust, is very unevenly distributed over the earth, they are found only in certain localities; hence, salt soon became a most important article of commerce, as in Northern Africa, in India,

etc., where it was found in great abundance, and yielded to the Kings of those districts large revenues. India had a city called Lavanapura; that is, Salt City.

From the harbor of Rome a street called the Via Salaria, or Salt street, served the Sabines, according to an old treaty, for the conveyance of their salt; and the same city had a salt commerce already in the times of their kings. Plutarch tells us of salt ships, and the noble Romans had a servant called the salinator in their households, whose business it was to care for the salt.

Where salt could not be secured, or only at great expense, the ashes of seashore plants were substituted, as is related of the inhabitants of Umbria, while others prepared their necessary salt by pouring sea water or salt brine on to a burning fire, whereby they imagined that the coals also changed into salt, hence the careful selection of the wood.

The most ancient information that we possess of the use of sea salt made by solar evaporation, comes from Dioscorides. Ancus Martius, according to Pliny, first introduced the so-called salt gardens, salinas, where sea water separated from the ocean was evaporated by the sun. He gives many places where they existed, as at Tarant, Sicily, Creata, Utica, Egypt, etc. In Cappadocia, even salt brine was thus made into salt. Both Aristotle and Pliny mentioned Epirus (Chaocia) as a place where salt was made of brine from springs by boiling, and from all we can learn on the subject it seems very probable that an Indo-germanic tribe, the so-called Kelts, were especially engaged in the manufacture of salt, which opinion is strengthened by the fact that many of the works now relating to salt and its manufacture, are of Celtic origin. Having thus given the main feature of the ancient history of salt, I will now proceed to give its constitution, character and occurrence.

Salt is a natural compound of a soft white metal called sodium, and a greenish very irritating gas, chlorine. Every 100 parts of pure salt contains 39.3 parts of sodium, and 60.7 parts of chlorine. It was Sir Humphrey Davy who first explained the true nature of salt, which, up to that time, had been considered a compound of soda and muriatic acid, hence its former name muriate of soda. Salt chrystalizes in the cubical form, and is thus often found native, but usually it is massive, sometimes granular and columnar. Its cleavage is cubical, hence, when we break a natural cube of salt very carefully, it yields a number of smaller ones. Its hardness is 2.5, while its specific gravity varies from 2.1 to 2.25. The lustre is vitrious, like that of broken glass. The color may be white, yellow, red, blue, purple or colorless (the reddish appearance of the Cordona rock salt, in Spain, is due to infusoriæ). Salt offers very little resistance to the rays of heat; 100 parts of heated rock salt will transmit 92 per cent., while a plate of glass of equal thickness will transmit only 24 per cent.

The taste of pure salt is agreeably saline. Exposed to moisture it seems to be slightly deliquescent. In regard to the solubility of salt in water it has been found that there is very little difference with cold and boiling water. At 32° F. 100 parts of water are capable of dissolving 35.52 parts of it, while the same quantity of water at 212° F. dissolved only 36.46 parts. At a common red heat it melts, and at an increased temperature it is volatile.

Our salt resources are either solid or dissolved in water. Of the former we have two kinds, the rock salt and the salt incrustations of some of the high plains and of the deserts, which are often literally covered with a thin crust of salt, like a vast snow-field of the cold zones. Of salt solutions there is, first, the vast extent of the ocean, whose peculiar color is due to the salt contained therein ; and secondly, the numerous salt lakes and salt springs.

The land, with its various mountains, hills and valleys, by the force of inner disturbances rising gradually out of the universal ocean, cut off portions of the water, and formed in this manner immense salt lakes. The burning heat of the sun and the inner heat of the earth produced an evaporation of the water, and the salt remained in a solid form. Heavy rains dissolved the saline matter out of the soil and carried the loose debris of the mountains on to this salt, the mechanically suspended material settled to the bottom and formed a layer of clay, while the water above, evaporating, left a second layer of salt, the lowest portion of which, if the water contained gypsum in solution, was formed of this material. Hence, we find usually in rock salt mines layers of clay, gypsum and salt alternating with each other. We also find gypsum as an almost constant companion of brines, and as it is a never wanting ingredient of all sea water, we may conclude that the sources of the many rock salt beds and brine springs are entirely due to sea water. Rock salt and salt springs are found in almost all the various formations of our earth's crust, as recognized by geologists, from the oldest to the youngest. Thus we find in South America salt springs coming from granite at Retico, near El Quarzo; also at Navarre, in Spain. From horn-blend rocks at Saline; from syenite at Cuaco and Rio Grande; from porphyry at Azuelo and at Kreuznach in Rheinish Prussia; from trachyte at Puravi; from mica slate at Quayeval in New Granada. Our Syracuse brines and those of Canada are in the upper silurian. The well at Staraja, Russia (Government Novgorod, Russia), comes from the devonian, while those of Michigan are found in the carboniferous limestone down to the devonian. Western Pennsylvania, Virginia, Ohio, Indiana, Illinois and Kentucky are furnished with salt from the lower coal measures. Russia has its main salt mines and springs in the permian, while the triassic period yields the rock salt and brine springs of the greater part of Europe, especially England, Ireland, France and partly Germany. The newly discovered immense salt resources of Northern Germany, at

Stassfurt, Leopholdshall, Segeberg and Sperenberg, near Berlin, are all in this formation. Oölitic formation of the Juarissic period contains the salt of the Austrian Alps. In the cretaceous we have a salt mountain at Cardona in Spain, and another in Africa at Biskra; also the salt of the Pyrenees belongs to this period. The celebrated rock salt deposits at Wieliczka in Galicia, and the rich mines in Sicily, are in the tertiary, while the rock salt deposits upon the Petit Anse Island, in Vermillion Bay, Lousiana, is considered as belonging to the post-tertiary. The position of these different salt sources, as compared with the sea level, is varied indeed. Thus, in the Austrian Alps, we have rock salt 3,000 feet above, and in Savoy even 7,000 feet above the sea, while at Wielczka salt is found 800 feet, and at Sperenberg, near Berlin, over 3,000 feet below the sea level.

A description of the various rock salt deposits, salt lakes and brine springs with which we are at present acquainted, is beyond my present purpose. I shall content myself with giving the most remarkable ones.

The most important salt deposit that has ever been discovered is that at Stassfurt, in Germany. After passing the shaft through about 558 feet of other material, the salt rock was reached, the upper portion of which, for about 500 feet, contains an almost inexhaustible supply of potash, in the so-called Stassfurt potash salts. The next, 1,000 feet below, consist mainly of rock salt of good quality. The importance of this discovery for many industries, and especially for agriculture, cannot be estimated. The production of the various mines in the neighborhood of Stassfurt, from the commencement, in 1860, up to the year 1876, was, of rock salt, about thirty million, and of the raw potash material no less than one hundred and seven million bushels. Near Berlin, at Sperenberg, in 1867, borings were commenced, and salt was found at a depth of about 283 feet. These borings have been continued until 3,769 feet of rock salt has been penetrated, without reaching the end of the salt. Laugro, in Calabria, possessed a salt mountain with 1,200 steps cut in solid rock salt, whereby its lowest workings are reached. The salt mountain at Cardona, in Spain, was worked more than 2,000 years ago, and what is most remarkable about this salt deposit is its gradual moving toward the opening of the valley, like an Alpine glacier, which led to the former belief that the salt grew as fast as it was taken away.

In the immense plains of the Kirgis Steppes, near Fort Hezkaga, suddenly rises an enormous salt rock, only covered on its surface with drift-sand. St. Domingo has a salt mountain at Neyba, and Arizona and Nevada are claiming several. The Wieliozka deposit, in the Austrian Empire, which has been mined almost a thousand years, could alone provide the world with salt for centuries to come ; it has over sixty rooms cut in salt, some of them very large ; the dancing hall has a fine gallery extending around it, an immense Austrian eagle and several chandeliers.

all cut out of salt ; its height is 150 feet, the other dimensions in proportion. The galleries are no less than 30 miles in length.

In the Carpathian range of mountains, which extend almost without interruption from Moldavia to Suabia, about 200 geographical miles, are the salt mines of Wallachia, Transylvania, Galicia, Upper Hungary, Upper Austria, Styria, Salzberg, and of Tyrol Brogniart counted no less than 59 rock salt mines, 15 of which are worked, and 430 brine springs.

SALT LAKES.

Salt lakes are found in great abundance in various parts of the world, especially in Persia, Barbary and Russia ; in the Province of Astrachan, one of the latter country, no less than 129 are found ; we meet them at different heights, as compared with the level of the ocean. Thus, the Lake Titicaca, in the South American Andes, is 18,000 feet, the Wausee, in Kurdistan, 5,460 feet, and the great salt lake in Utah 4,200 feet above the ocean, while the surface of the Dead Sea, according to Humboldt, is 1,230 feet below the level of the Mediterranean. The Caspian and the Aral Lakes are the two largest ones in the old world. Best known, perhaps, is the Alton Lake, in Saratov, Russia, yielding annually no less than 100,000 tons of salt. In the Podolonian Desert is a lake near the river Dneiper, whose water evaporates during the Summer months to such an extent that people ride into it with horses and wagons, cutting salt in blocks and carrying it away in the same manner as our ice dealers cart away their stock in the Winter time. Utah's great salt lake, 120 miles long and 30 miles wide, was already known to La Houtan, the French Lieutenant-General of Newfoundland, in 1689. The salt deposit on its banks was estimated by Captain Stansbury at 10 miles in length by 7 miles in breadth, and as containing no less than one hundred million bushels of salt. The South American Pampas are shallow salt lakes, extending from Fort St. Julian, in Patagonia, to Chaca, in the Argentine Republic. The Dead Sea, on the south side of which, at Usedom, are extensive salt rock deposits, formed in most picturesque shapes, is gradually decreasing in size, since at the time of Josephus it measured over fourteen geographical miles in length by four miles in breadth, while to-day it is only ten miles long and about two and a half miles wide.

The gradual filling up of salt lakes by salt deposits in historical times gives us another explanation, and, undoubtedly, the most probable, of the formation of some of these enormous salt deposits I have mentioned previously. Generally these lakes have no outlet, and they are supplied by rivers, which, in their course over salt-bearing rocks and through salty soils, dissolve and carry it into these lakes, especially during the rainy season of the year. The mechanically suspended impurities of the river water, such as clay, Marl, etc., separate, first forming a layer at the bottom of the lake, which is often colored reddish by iron, if the latter be present in the water ; next, the less soluble salts, such as gypsum, sepa-

rate, forming a second layer ; and, finally, the salt, which forms the third layer. Year by year this process is renewed, and thus gradually, but certainly, is a rock salt deposit formed.

Gobel, in 1805, sunk a well some miles from the Elton Lake, and found forty-two separate layers of salt from one to nine inches thick. At a depth of 12 feet the salt was so hard that the iron tools broke.

The amount of salt that the ocean annually receives from salt springs that are not made use of, is a great deal more than we usually suppose. Mitcherlich has calculated that the river Saale, in Germany, receives annually from the salt springs at Durrenberg, 3,000,000 bushels of salt, which quantity is almost imperceptible in the water of the stream.

The amount of salt in the water of the ocean, which is our third source of supply, is about 2.7 per cent. in 100 of the water, but the quantity of salt made from it, especially in the Southern parts of Europe, is very large indeed. France alone produces 400,000 tons annually. In the United States the first sea salt was made in Virginia, at Cape Charles, in 1620. The most celebrated varieties are the St. Ubes, the Turk Island, and the Trappani sea salts.

SALT SPRINGS.

When the rainwater, during its passage from the surface through the various formations of the earth, comes in contact with such of them as contain salt, before it issues again as a spring, it dissolves more or less, according to the time of contact with the salt-bearing strata. Syracuse possesses the most prolific salt wells, within the smallest territory, known in the entire world. The presence of natural salt springs in our neighborhood is first reported in the so-called relations of the Jesuits, by the French Missionary, Jerome Lalement, in 1645-46. In 1788, one of the Indians discovered to Col. Comfort Tyler a salt spring at the foot of Salina Heights, and in the same year, on the 12th of September, the Onondagas sold to the State of New York the so-called salt reservation, comprising the lands for one mile around the lake, more than 15,000 acres, for the purpose of making salt. Since 1793, the State has had the supervision of our salt sources, and from that time till now, no less than 256 million bushels have been made, to which we must add the loss of leakage, blocking, etc., so that the grand total in 80 years can not have been less than 300 million bushels. In China, in the province of Sza-Techhouan, are a number of salt wells which evolve so large a quantity of inflammable gas, that it is employed in the evaporation of the brine. Mons. Imbert reports that there are several thousands of these wells in the vicinity of the town of On Thouang Kheas. It is impossible, in the short space of time at my disposal, to speak of other brine springs, suffice it to say that, with very few exceptions, almost every country on the globe possesses salt in one form or another, the source being inexhaustible.

There are no reliable statistics on hand that give the actual amount of salt annually produced on the earth, but England, which possesses by

no means the largest resources, is, nevertheless, the largest producer at present, on account of her commercial facilities ; she made in 1876 no less than two million tons. The uses of salt are so manifold that only a few of the most important ones can be mentioned here. It is employed in the manufacture of soda ash, sal-soda, baking soda, glauber salts, soap, bleaching powder, pottery, and in many metallurgical operations. For the conservation of fish, meat, hides, butter and cheese, etc., large quantities are annually used. It is estimated that a human being uses from 10 to 15 pounds per year, which, for 1,000 millions of inhabitants, taking the average at 12½ pounds for each person, would amount to no less than 225 million bushels, or over six million tons. If we add to this the amount given to domestic animals (Spain uses alone over four million bushels of salt for her Merino sheep), also that employed in the dairy, for packing meat, fish, hides, hay, etc. (the proprietor of one packing house in Kansas City told me last year that he alone used over 120,000 bushels annually), that used as manure, and finally that which is used in the arts and in the various manufacturing enterprises, the grand total cannot be less than ten million tons.

The familiar saying of Liebig, that a nation's prosperity and its state of civilization might be measured by the quantity of soap it uses, I think is much more applicable, as Schleiden remarks, to salt.

Before the year 1789, in which Leblanc made his immortal discovery of making soda ash from salt, the necessary demand was made partly from the water of the so-called soda lakes, found in Egypt, Hungary, etc., and known under the name of troma; another supply was derived from the ashes of seashore plants (which were cultivated especially for the purpose in Spain, etc., the product being called Barilla or Rochetta), or from seaweed ashes; in France they call it Varec, while in Great Britain it received the appellation of Kelp.

Thus, gentlemen, have I given you, as far as time would permit, the main facts relating to the history, the composition, the character, the occurence and the uses of salt, and will now enter on the second part of my remarks, the manufacture of salt, thec oncluding portion of which will be devoted to the dairy salt, in which you all take so deep an interest.

THE MANUFACTURE OF SALT.

The direct production of salt for domestic purposes from rock salt is only possible when the latter is sufficiently pure. If such is the case, various mechanical means are employed to reduce the lumps of salt as they are brought to the surface from the mine to the required state of fineness, in accordance with the uses for which it is intended. Dairy salt is, I believe, rarely made of it, although I know from very good authority that it is done in Boston, and an addition of carbonate of soda is made to the salt, because it contains some chloride of calcium and magnesium. The usual method is to dissolve the rock salt, either di-

rectly in the mine or after bringing it on the surface, for the purpose of separating from it the mechanical impurities, as clay, marl, etc., and then to evaporate it in the usual manner by artificial heat, in pans or other suitable vessels. In Belgium and Holland sea water is employed for the solution of English rock salt (these countries have no salt resources of any extent). The refined Dutch salt is preferred in Ireland for flavoring the celebrated Irish butter; the Liverpool pan salt has proved to be not well suited for the purpose. If this is due to Irish prejudice, or founded in fact, I am not able to decide; it may be possible that Ashton Salt has had no proper trial in Ireland, or the Irish butter may have partaken of some of the Irish hatred against England, and, therefore, will not allow its being kept by the English product, even if it should be Ashton.

SEA SALT.

The manufacture of the greater portion of the sea salt is carried on in the so-called Salt Gardens; a system of deep and shallow earth reservoirs, clayed on the sides and bottoms. They are generally situated on the shore in the most advantageous position, and so connected with each other that the water, by its own specific gravity, can pass from the first through all of them into the very last one. The sea water enters from the ocean through a flood gate, at the time of the tide, into the first reservoir, which is from four to six feet deep, covering often several acres of ground. The mechanically suspended impurities sink readily to the bottom as soon as the water becomes quiet therein. This having been accomplished, the second gate is opened and the water flows into more shallow reservoirs, in which it remains till all the less soluble salts, such as the carbonates, the sulphate of lime, etc., have been removed, as far as such is possible, and the water has become saturated, when it contains from 26 to 27 per cent. of saline matter in 100 parts of water. Thus purified and concentrated, it enters a third set of yet more shallow reservoirs, in which the salt crystalizes out. The latter, if in sufficient quantity, is removed upon the banks between the reservoirs for drainage, while a new supply of saturated water takes its place to furnish new quantities of salt. Since the water that remains after the removal of the salt, and which is called mother liquor, contains, besides salt, the more soluble salts, such as the sulphate and chloride of magnesium, and their quantity increases with every new addition of pickle, it is occasionally removed, thereby preventing a deterioration of the product. Precisely the same process is followed by our solar salt manufacturers, with only this difference, that wooden vats, with movable covers, are substituted for earth reservoirs, which has this advantage, that a considerable amount of the obnoxious chlorides of calcium and magnesium—they possessing great penetrating power—pass through the wooden bottom of our vats.

Boiled salt is usually made from the salt brines, either as they come from the bowels of mother earth, or if too weak to be thus remunerative, they are concentrated by the so-called gradation works, which are very extensively used in Germany.

Brines, as they come from the wells contain many impurities, such as traces of iron, lime and magnesia, as carbonates or as chlorides and sulphates. Since the carbonates readily separate, either by an exposure to air, or after an addition of a little quick lime, one or both of these methods are employed together. The brine, thus prepared, is now evaporated in shallow iron pans over fires, or by the application of steam, or in kettles.

All good brines contain gypsum, a substance less soluble in hot and saturated brines than in cold and weak ones; it is, therefore, customary to heat the brine in one pan until it commences to boil and is fully saturated, and then to discharge it into others in which the salt is made. In accordance with the use that shall be made of the salt, it is either boiled, whereby a fine grained salt is the product, or it is evaporated at different temperatures below the boiling point, whereby larger grained varieties are the result. To give to the salt a very fine grain, the salt, in the language of the salt-boilers, is cut by the addition to the brine of substances considered harmless in themselves, such as soap, gelatine, wax, butter, lard, resin, white of eggs, calves' and cows' feet, ale, flour, alum, etc., which assist somewhat in clarifying. The scum that appears on the surface after these additions, is removed by skimming.

Our kettle method differs from the preceding in this, that we accomplish the separation of the impurities and the salt in one and the same vessel—our kettle.

DAIRY SALT.

Since, I hope, gentlemen, that you accept the invitation and will visit the mill, my description of our process shall be very brief.

The salt, in a proper state of sub-division, usually accomplished by crushing the raw material (either common, fine or solar), is subjected to a process of washing in washing machines, with a pure salt pickle, which contains the necessary amount of carbonate of soda for the decomposition of the chlorides of calcium and magnesium, the resultant carbonates of lime and magnesia, and a portion of the gypsum contained in the raw material run off with the wash water. After a proper drainage of from 10 to 14 days, the salt is dried in large iron revolving cylinders, and then ground to the desired fineness. In regard to other processes employed in the manufacture of dairy salt, I can state nothing from personal observation.

Of late a great many attempts have been made, long articles have been published in various papers, and especial refererce has been made to the New York salt test, made two years ago, for the purpose of convincing the dairy community that only English Ashton salt can preserve butter

and cheese. I may, therefore, be justified in calling your attention to the subject :

In the second annual report of the American Exchange for 1875, page 14, the committee on the dairy salt test reports :

"The result of these tests suggests that some differences are possibly detectable in butter salted with American and the various foreign salts ; but it is evident that the difference is much less marked than has been popularly supposed, and only becomes apparent after long and very close observation of the form of the grain of the different salts, and other minute variations that would be noticed by very few of our most experienced butter men. Chemically, it has been shown by a series of analyses, made under the direction of the committee, that there is very little difference in the amount of chloride of sodium (pure salt) contained in any of the competing brands. Samples of nine brands were selected by your committee from the stocks in warehouses here, and were intrusted to Messrs. Walz and Stillwell, chemists of high standing, by whom the analyses were made, and the above result reported."

Again I quote from the same page :

"It is this system of fraud that has done much to injure several of the brands shown by the analysis to be very pure, especially the Onondaga salts.

"The very slight differences in the chemical purity of the competing salts suggest that there should be less inequality in the prices of these salts than has existed for some years past. It would seem that the prices of all the principal brands should be the same, and it is hoped that the result of the committee's labors may aid the dairymen in breaking down the excess that has been for so long a time charged for the supposed superiority of some brands."

From a comparison of the analytical results of the above named chemist, as reported on page 12 (confining myself to English Ashton and the two Onondagas), it is evident that, while the differences are but small, the Onondaga samples contained *less insoluble* matter, *less sulphate of lime*, *less chloride of magnesium*, and one sample three-quarters and the other over one-half of one per cent. more *pure salt* than English Ashton. Both American samples contained a trace of chloride of calcium (0.0473 and 0.0296), which was absent in the English Ashton. According to Professor Goessman, chloride of calcium is less injurious to the taste of butter and cheese than chloride of magnesium. Ashton, moreover, contained sulphate of magnesium, which has a bitter taste like chloride. Adding the various impurities together, the English Ashton contained, in the analyzed sample, 1.4196 per cent., the Excelsior 0.7609 of one per cent., and the Onondaga Ashton 0.83 of one per cent., from which it follows that our salt samples were superior, both in quantity of salt and absence of impurities. The chairman of the Salt Committee, at their final meeting in New York, as reported in the *American Grocer*,

April 10, 1875, commented on the general high character of all the samples and the comparative absence of deleterious matter. From the results or the practical tests on January 18th, 1875, and April 6th, 1875, I quote the remarks of the examiner upon condition :

M'ALLISTER.

Onondaga, No. 1.—January 18th, 1875, "Not much body and rather flat in flavor;" April 6th, 1875, "Butter mild, fine flavor and well kept."
Onondaga, No. 5.—January 18th, 1875, "Quality good;" April 6th, 1875, "Can taste a little more undissolved salt, but good flavor."
Onondaga, No. 10 —January 18th, 1875, "Better quality, and more body to the butter."
English Ashton, No. 6.—January 18th, 1875. "Quality good, little best flavor;" April 6th, 1875, "Butter, mild flavor and in good condition."

BLODGETT.

Onondaga, No. 2.—January 18th, 1875, "Harsh, with undissolved salt;" April 6th, 1875, "Butter very high salted and harsh."
English Ashton, No. 1.—January 18th, 1875, "The mildest and most pleasant flavor;" April 6th, 1875, "Good flavor and well kept, but too salt."
English Ashton, No. 4.—January 18th, 1875, "Best flavor and high quality;" April 6th, 1875, "Bottom half cheesy and not well kept; the top half good color and flavor, and can taste more salt."

I suppose that neither English Ashton nor Onondaga can be held responsible for the excess in salt. In the test, on April 6, 1875, where no excess of salt was used, they were in one instance alike. Onondaga "Butter mild, fine flavor, and well kept." Ashton English "Butter mild flavor, and in good condition." But in No. 4 Ashton, "Bottom half cheesy, and not well kept. The top half good color and flavor, and can taste more salt." If the salt is responsible in this instance, then, gentlemen, I am satisfied that Ashton is not superior to Onondaga in keeping qualities!

Two years later, at the fourth annual convention of the National Butter and Egg Association, held at Chicago, March 7, 8 and 9, *The United States Butter, Cheese and Egg Reporter* (NOW THE AMERICAN DAIRYMAN) attributed the following remarks to the late Chairman of the New York Committee on the Dairy Salt Test: "From personal experience he (the former chairman) testified in favor of Ashton salt, as being the best adapted to dairy purposes. The difference in the brand of butter, where inferior salts are used, can at once be distinguished. *From 10 brands of salt, the Ashton* (English) *had been selected as the best salt, by the best chemists.*"

Again, I find in the *New York Commercial Advertiser*, December 1, 1877, in the article on butter and salt, the following paragraph :

"And therefore," says Mr. Folsom, "*the committee unanimously reported Ashton's factory filled salt as being the best salt to use in the making of butter.*"

It is unnecessary, on my part, to comment on the differences between

the results and statements of 1875 and 1877. Gentlemen (such facts as these speak volumes), you can draw your own conclusions.

(I do not intend to say that Syracuse salt is superior to other dairy salt of equal purity; all I claim is, that it is as good.)

My idea in regard to making a proper test to settle this question would be as follows:

Samples of salt prepared by a good chemist, which contain the various impurities usually met with in dairy salt, should be employed to salt equal quantities of butter, all made at one churning. Thus one sample should be salted with chemically pure salt (the experiments in Denmark with chemically pure salt in the salting of butter, according to Schleiden, proved that it will not preserve butter), another with salt containing sulphate of lime, another chloride of calcium, another chloride of magnesium, another sulphate of magnesia, and another sulphate of soda, etc. A sample of the butter, before dividing it in equal parts, must be taken out for analysis, to determine the amount of casein and sugar. All the samples kept under precisely the same conditions and tested from time to time, would soon show which impurities in dairy salt are most deleterious to butter. Manufacturers would then be enabled to use their skill in removing them.

The impurities found in dairy salts are so small, when we compare the amount of salt employed with the amount of butter salted therewith, that they can have, in fact, no deleterious action. Thus an average analysis of our dairy salt, taken from my daily samples of both mills for an entire season, gave the following results?

Pure Salt—Chloride of Sodium	98.3998	per cent.
Chloride of Magnesium	0.0365	"
Sulphate of Lime	0.9474	"
Chloride of Calcium	0.0169	"
Moisture, Indissoluble Matter and loss	0.5679	"

Now let us make a little comparative calculation. One pound of butter, 16 ounces, equals 7,000 grains. One ounce of salt used for salting, equals 437½ grains. These 437½ grains contain of impurities:

Chloride of Magnesium	0.1378	grains.
" Calcium	0.0739	"
Sulphate of Lime	4.2438	"
Total injurious impurities	4.3555	

This ounce of salt, mixed with 16 ounces or 7,000 grains of butter, the impurities in the 17 ounces will be, in per cent.,

Chloride of Magnesium	0.00185	per cent.
" " Calcium	0.00099	"
Sulphate of Lime	0.05571	"
Total impurities in 100 butter	0.05855	

Hence, not quite 6-100 of one per cent. of impurities, a quantity so small that a homeopathic physician would almost doubt its effect, even

if it was one of his most potent remedies. In the opinion of every chemist, the chemical composition, and it alone, is the proper standard to judge dairy salt by. The required grain has nothing to do with the antiseptic quality of salt, and can be given to it in accordance with the use that shall be made of it.

The letter of Professor Arnold, on salt, that appeared in the *American Grocer* of April 10th, 1875, addressed to O. C. Blodgett, Esq., the remarks by Professor Goessmann on the same subject, at the New York meeting, before the Butter and Cheese Exchange, in December, 1874, and, finally, the paper of Mr. Blodgett on "Butter-Making," read before the American Dairymen's Association, at Utica, in January, 1875, contain all that need be said on the subject of salt. Prejudice, that is fostered by certain interested parties, has much more to do with this question than the quality of the butter salted. When two samples of salt are equal in chemical composition and grain, they must be equal in their preserving qualities. To talk of secrets that shall impart to salt higher preserving qualities, which chemists cannot detect by analysis, or that only one establishment in the world has brine pure enough or workmen skilled enough to make a proper dairy salt, might have answered 50 years ago.

At the close of Prof. Englehardt's address, a brief discussion followed.

Mr. Lewis: Perhaps I can throw some light on this question. I am one of the four who voted against the resolution that passed, for the reason that I will never crush a domestic enterprise for the sake of building up a foreign one. I found that this New York butter committee attributes every defect whatever to the salt that had been used. In some cases examiners declared that they did not know anything about it. On one occasion a very confident examiner, being presented with samples from the same tub, side by side, declared the one to have been salted with Onondaga salt and the other Ashton's, and afterward reversed his decision, by examining the same samples, not knowing that they came from the same package each time.

Mr. Moulton: Salt effects the flavor beneficially or otherwise? I have two samples of salt in the room, and would be pleased to have them tested and compared, good samples of Onondaga salt, and let the question of flavor be submitted.

Mr. Farrington: If the statement of Mr. Moulton is correct, and I have no reason to doubt it, that the city of Syracuse was built upon salt, and in consideration of the immense interests connected with this question, it seems to me to be of far too much importance to be disposed of in a hasty manner. According to Squire Lewis' statements, it would appear that no sufficient systematic tests have hitherto been applied. I would think it was time this question was settled. Its importance is such that there should be a series of systematic scientific experiments

made that this question may be settled more satisfactorily, being, as it is, so intimately connected with the interests of domestic enterprises.

Mr. HORR: When we consider that those Englishmen are nearly four thousand miles away, with the Atlantic between them and New York, our Syracuse manufacturers having all this in their favor, it seems to me that they ought to take care of themselves, without a protective tariff. I like honest square competition. I am not afraid of the Englishman's salt any more than I am of the New York man's oleomargarine. If they can produce it and bring it from across the water, producing a better and cheaper salt, I say let our home industry take care of itself. It can do it and it will do it.

Mr. FARRINGTON: There seems to be two questions in this subject of salt. The tariff question is an abstract one, and should be discussed independently of the merits of salt. Some dairymen in Canada having experimented, say that Liverpool salt is the best, others prefer Canadian Goderich salt.

A MEMBER: Can Mr. Arnold tell us what are the usual impurities of salt, and their effects?

Mr. ARNOLD: The largest impurity is usually sulphate of lime, which is chiefly objectionable simply on account of its being a foreign substance. It can do very little harm, since it is so insoluble as to require 400 times its weight of water to dissolve it. Another impurity is sulphate of magnesia, or epsom salts, which is found, I believe, in pretty much all salts but the Onondaga factory filled. This gives butter a peculiar flavor, but not a very disagreeable one. Another is chloride of calcium, which has a pungent flavor, and causes salt to become wet in damp weather. The most disagreeable impurity in salt for butter and cheese is chloride of magnesium which imparts to both butter and cheese an acrid, bitter taste, that renders them untoothsome, and depreciates their market value. Sulphate of soda is also sometimes present, and also some insoluble matters which are presumed to have little or no effect.

Second Day.

Wednesday Morning's Session.

The convention resumed at 9:30 o'clock, R. P. Cannon in the chair.

The first subject discussed was whether additional cream can be worked into whole milk cheese, and the mode of doing it.

Mr. CHAMBERLAIN introduced the subject by giving his method. He said:

I get the milk ready to set, then I take the cream that I intend to add to it, and first mix it with a small quantity of milk, agitating it all the while, until the cream is sufficiently dissolved. Then I pass it through the strainer into the milk which is ready to set. Then add the rennet, agitating the milk continually until coagulation takes place. By so doing I get a perfect cheese.

Ques. Did you work the cream in the cheese, or did it escape with the whey?

Ans. I think the cream was mostly saved in the cheese. In fact I am satisfied it was a success; still I would not recommend it for general practice. There is cream enough in the milk.

Ques. Where did you get the extra cream from?

Ans. From the milk of the day before.

Mr. Adamson, Indiana: Previous to our State fair I tried an experiment, mixing six pounds of cream, taken from the night's milk, with one hundred and forty four pounds of new milk, and made it into a cheese. We had often heard it remarked that if cream gets separated from the milk, it is almost impossible to get it to unite again. The result was that we found little cream went off with the whey. From the 150 pounds we had a cheese, when cured, that weighed 15½ pounds, and was considered, by all who saw it, to be a little nicer than anything they had seen in the shape of cheese.

Ques. When was it made?

Ans. On the 20th of August.

Ques. Do you think that if cream is separated from the milk it can all be retained in the cheese?

Ans. I do not think it can be retained as perfectly as when not separated. I merely give that as my opinion.

President: I think if you use a large percentage of cream, there will be a little more waste; that is, if you use a rich material, the percentage of loss will be greater than if you use a poor material.

Prof. Stewart: I have had no personal experience with reference to this matter of working in an extra amount of cream, but have made cheese from the milk of Jersey cows which contained a large proportion of cream, and the waste was found to be less than ordinarily is the case.

Mr. Rice: We have had some experience in this matter of working in the cream that has gathered on the night's milk, and have found that if the cream was not allowed to get too thick, we could work it in effectually.

Mr. Wire: I think it is generally conceded by all cheese-makers that the richer the milk the greater is the percentage of loss. My idea of working in all the cream is, that it depends altogether on the manner of handling. We are satisfied that the cream will not produce a firm curd if the rennet be added while the cream is separate from the milk. All cheese-makers know that the cream is continually seeking the surface of the vat, and the difficulty is in having it perfectly incorporated. If left but five minutes the cream will be found at the top. Sometimes it rises more rapidly than at others. If the temperature of the room be below the temperature of the vat, coagulation will be imperfect. Cold opposes the action of the rennet. I practice covering my vat if the temperature of the room be below the temperature of the milk. When ready I cut it

lengthways of the vat and allow it to settle without cutting it any more, cover the whole. I find that the curd is firm and in better shape to handle than by cross-cutting. As regards adding an extra amount of cream to the milk, I have never done it.

BRANDING OLEOMARGARINE.

The chairman announced that the time had arrived for the discussion of the question whether or not the General Assembly of Ohio shall be petitioned for the passage of a bill requiring the manufacturers and dealers in oleomargarine to brand it, so that people will know what they are purchasing.

The discussion was opened by R. P. CANNON, who said :

If this bill is passed it will require the manufacturers and dealers in this imitation butter to brand it with "Oleomargarine." The manufacture of this article has been brought prominently before our attention here, and we are doing it no injustice by passing this bill requiring it to stand upon its own merits, and branding it so that people will know just what it is. This bill is in force in New York State, and I trust a similar one will be passed by the Legislature of Ohio. As Dr. Mott rejoiced in the name and said it would be an inestimable trade mark, the resolution proposed throws no discredit upon the product.

Mr. ARNOLD: When this resolution came up last night, I understood it to be offered for the consideration of the American Dairymen's Association, and for that reason I opposed its introduction. We have called here both the friends and opponents of oleomargarine and invited the fullest discussion of merits and demerits. It has been the policy of the association, since I have been connected with the Executive Board, to pursue this course with all the novelties of whatever name or nature, whether patented or otherwise, being satisfied to bring out such facts as we could by discussion without espousing either side of contending parties. From what has been developed, we find oleomargarine a competitor with 2d and 3d rate butter, and I am averse to having the American Association depart from its usual rule and take sides with either of these competitors. But now, I understand, the resolution is offered solely for action by the Ohio members—the members from other States remaining silent when the vote is taken—and to this I have not a word to object. It is legitimate and proper for Ohians alone to decide on what relates especially to their State, without action by the American Association.

Mr. CURTIS: It would appear that the convention is in somewhat of a muddle with reference to this question. None but citizens of Ohio, who are members of the Association, should vote on the resolution.

Dr. MOTT: The object of science is to find out the truth, to ascertain the true nature and constitution and merits of what we use. This product contains nothing unwholesome, has met with a hearty reception with the people. I would like to know why the supporters of this resolu-

tion do not also require the makers of oleomargarine cheese to brand it oleomargarine.

The bill should certainly be amended so far as to prevent dairymen, who make a poor article of cream butter, from forcing it on the market by labeling it oleomargarine butter.

Prof. STEWART: As a citizen of New York, I would say that I fully endorse the act of our Legislature in passing the bill requiring this product to be stamped oleomargarine. They claim that they make a good article, but that is no reason why they should call it butter. There is not the same reason for requiring oleomargarine cheese to be so stamped, because it is made principally of milk with a slight addition of oleomagarine. This, however, is made wholly out of fat, with a small addition of milk to give it the flavor.

Rancid butter is, however, butter, though it is poor butter, and anybody can detect it by its smell, taste, etc.

Agricultural interests demand that if a person make something that they say is as good as butter, but is not butter, they should be required to stamp it with just what it is. Have they a right to complain? Now, it appears to me that the objection to their being required to stamp it with its true name is, because they wish to get it in under the name of butter. If it is going to be a splendid trade-mark, why not sail under their own colors. I am glad to see the Ohio Association taking this stand. They should be required to put their name upon it, and if it is a good one, it is all right.

Dr. MOTT: I am surprised to hear Professor Stewart speak in this manner, when the two products are identical in their constituents.

Mr. STRAIGHT: I am decidedly in favor of this resolution, and hope every factoryman and dairyman will vote for it.

I have no controversy with Dr. Mott, but I met a most enthusiastic gentleman, who was going to dish us up in fine style. According to his statement, oleomargarine is taking the place of butter everywhere. It was bound to do it. It was the most wonderful invention of this century. The telephone was nothing compared to it. Cows would be of no value only as a means for raising calves. He did not talk like Dr. Mott. I was not frightened, however, not one particle. I believe I can find enough customers in the United States for all the fine butter I can make. All I ask is, that the oleomargarine sail under its own colors. This gentleman said he was selling it for from 20 to 40 cents a pound, when butter was bringing only from 18 to 20 cents.

I understand that in New Orleans consumers are very much put out about it, because of the imposition. I think we have reason enough for demanding that it should sail under its own flag.

Mr. WIRE: I have only one objection to the bill, and that is that cheese is not also included. I do not see why the argument is not as plausible for the making of oleomargarine cheese.

It was moved by Mr. Wire that cheese be included.

Mr. FOSTER: Why should our Western Reserve dairymen feel afraid of the consequences. It is acknowledged that this oleomargarine is not to be compared with the prime article; it only comes in competition with cheap, rancid, inferior butter. Let us make nothing but a superior article, and stand our ground beside the oleomargarine without the aid of the Legislature.

Mr. STRAIGHT: This man that I referred to, made the statement that the product was being used by every first-class hotel in the country. If this is true, it is competing with the genuine first-class article.

The resolution was then submitted to the Convention, the Ohio members alone voting.

A standing vote being called for, the resolution was declared carried.

The Chairman then announced as the next topic for discussion, Temperature in the Dairy, and introduced G. C. Caldwell, Professor of Agricultural Chemistry, Cornell University, who addressed the Convention as follows:

TEMPERATURE IN THE DAIRY.

The proper regulation of the temperature is, as every dairyman knows, a matter of the highest importance throughout the whole series of operations in the dairy, from the time that the milk is received till the manufactured product leaves the factory for market. It is not impossible, therefore, that we may find some material for profitable instruction in bringing together the varied observations that have been made on this subject and finding out just where we stand, and wherein we are groping somewhat blindly for want of more light. I shall not be able to fully occupy so wide a field as this, if I keep my paper within such limits as not to trench upon the time wanted for discussion of other and more important subjects to come before the convention; but a small beginning on my part may open the way for somebody else to make a good ending. This matter of temperature forces itself on our consideration even before the milk reaches the dairy, where it is to be manufactured into butter or cheese, or both. The milk is drawn from the cow at the temperature of blood heat; what shall we do with it? Cool it quickly by artificial means, or let it take its own time for cooling?

So far as I can gather information on this point from the recorded experience of dairymen, it conveys but one lesson, which is, that the immediate cooling of the milk down to from 70 to 50° greatly improves its keeping quality without in any degree unfitting it for subsequent manufacture into cheese or butter, or condensed milk. The manufacturers of condensed milk include in the well-considered code of rules that they impose on their patrons the immediate cooling of the milk as soon as drawn, as one of the most important of their regulations; and it is asserted by cheese-makers of experience that the cooling of the milk before sending it off to the factory, or before setting it aside for the night, pre-

vents the occurrence of some of the most serious troubles that beset the cheese manufacturer, such as floating curds, off-flavored cheese, and the like. Only one objection has been raised against the rapid cooling of the milk to a low temperature. This objection is based on the supposed existence in all freshly-drawn milk of a certain something that communicates to it a disagreeable odor, and unless removed, a disagreeable flavor to the products manufactured from it; that this "animal odor," which can be easily expelled by heating the milk to 100° or 110°, or by stirring the milk while cooling it, is retained in the milk if it is rapidly cooled, and being thus converted from an odor to a flavor, it is sensible only to the taste in cooled milk; but when such milk is heated, it is asserted that it gives off an odor again, and skilled dairymen claim that they can detect this flavor in butter made from milk that was rapidly cooled. That there is something of this kind in milk would appear to be very positively indicated by the strong disagreeable odor that comes from the condensing pans of the condensed milk factory. All the milk taken to these factories is rapidly cooled to about 50°, so that this supposed animal odor has little or no chance to escape, and all of it is driven off when the milk comes to be heated. The existence of this odor, or flavor, is also indicated by the fact that freshly drawn milk has a very unpleasant taste to many people—a taste that is persistent in the mouth like that of a disagreeable medicine, such as castor oil. But further than these indications, we have no proof of the presence of such a substance in milk, for it has never been separated out of the milk and studied by itself. It is not mentioned in any of the older works on physiology, nor in some more recent works devoted to milk exclusively. In the latest work on this subject by Dr. Fleischman, which is being issued from the press now, the author alludes to the statements made in America as to this animal odor, and is inclined to ridicule the idea, since such a thing has never been mentioned in Europe, where the products of the dairy have the best reputation for delicacy of flavor. It must be confessed, I think, that further observation is necessary to establish the fact of the existence in normal, healthy milk of this substance, this gas or volatile oil, with the properties that have been attributed to it, which may be transferred to the butter or cheese made from the milk, and will communicate to either of these a flavor perceptible to the average sense of taste.

It can hardly be questioned but that excellent butter has been made from cream obtained by such a process as that of Hardin's, in which the milk is put at once in tight cans and surrounded by a very cold atmosphere, and quickly cooled. In such a case the animal odor is very effectually shut in, and should unmistakably show itself in the flavor of the butter. It is claimed by many who have tried other methods similar to it that no such flavor is to be detected.

As to the beneficial effect of the artificial cooling of the freshly drawn milk but one explanation of it is to be given: It puts a check on the

tendency to fermentation, which, like all fermentative processes, goes on much less rapidly in a cold liquid than in a warm one. I need not dwell on this point, and I hasten to the consideration of another matter, in regard to which there is no little difference of opinion—*the most favorable temperature at which to set the milk for raising the cream.*

In treating of this part of my subject, it will be convenient to designate by the term *serum* the liquid containing the casein, sugar and salts, in which the globules of fat are suspended. Now, independently of the disputed question as to whether each globule is enclosed in a membraneous sac or not, we are justified in drawing the inference from well-established physical laws, and from the results of many careful experiments, that there is around every globule a layer of this serum, which has a density greater than the average density of the whole serum, just as in any vessel of water or other liquid there is in contact with the walls of the vessel a layer of the liquid possessing a greater density than that of a layer taken at an almost insensible distance from the walls, this condensed layer of serum will accompany the globule in all its movements, and it is the friction between this condensed layer of serum and the main body of the liquid which constitutes the obstacle to the passage of the fat globule to the surface. It also follows from the laws of physics that the smaller the fat globule the greater this frictional resistance will be in proportion to the tendency of the globule to rise to the surface; in the case of the largest globules the resistance is smallest in proportion to the tendency to rise, and these globules reach the surface first ; smaller globules come up later, and in the case of the smallest the resistance is so nearly equal to the buoyant force that they will not rise for weeks.

Changes in the temperature of the milk may affect the manner in which the cream rises to the surface in several ways.

As is well known milk at all times possesses a certain viscocity or adhesion of its particles to one another, which distinguishes it from water. This viscosity is greater at low temperatures than at high, and as a consequence the friction that opposes any movement of the particles of the milk among one another is greatest at low temperatures. If no other effect than this were produced by lowering the temperature, the cream should rise more slowly at low temperatures.

All bodies, solid, liquid, or gaseous, expand when heated, but not to the same extent ; 100 cubic inches of water expands by 0.045 of its volume; when heated from 32° to 112, or the 100 cubic inches will become 104.5; 100 cubic inches of olive oil, on the other hand, would expand to 110 cubic inches, or the rate of expansion of the oil is about twice as great as that of water. As bodies expand given volumes of them become lighter; a cubic inch of water at 100° is lighter than a cubic inch at 40°. The more they expand within the same limits of temperature the lighter the cubic inch becomes; therefore the upward push of

the fat globules should be greater at higher temperatures than at low, because the difference between the specific gravity of the fat and water is greater at high temperatures than at low; but milk is not simply a mixture of olive oil and water; it is made up of butter fats and serum, and the serum contains casein in solution, and probably in suspension also, and sugar and salts in solution, and we know nothing about the rate of expansion of this complex mixture, and consequently we can draw no safe conclusions from these data as to the comparative rapidity with which the fat globules should move upward at low and high temperatures.

As a liquid changes in temperature the cooler and heavier portions tend to move to the lowest part of the vessel occupied by the liquid, while the warmer and lighter portions are crowded to the uppermost parts of the mass; currents within the liquid are thus produced which may or may not retard the upward movement of the cream. In a wooden vessel set in the atmosphere of a cool room, the cooling will take place mostly at the surface, the cooler particles will drop to the bottom, producing a continuous downward current along the sides of the vessel, where the liquid is cooler than in the middle, while in the central portions of the mass there will be an upward current; the natural result of these currents will be, like that of any disturbance of the perfect quiet of the liquid, to retard the collection of the cream at the surface; if, on the other hand, the milk is cooled in a metallic vessel in a bath of cold water, the coldest portions are to be found along the vertical walls of the vessel from top to bottom, and on the bottom, the heat being readily conducted away through the metal to the water; as the upper part of this layer of liquid along the walls of the vessel is no cooler than the lower part, there is no tendency for it to drop to the lowest part of the vessel, but rather to simply slide in towards the inner and warmer portion of the liquid, making a slight downward and inward motion at the same time; the same movement will take place throughout this outer layer from top to bottom; there will be no continuous currents running from top to bottom and *vice versa*, as in the wooden vessel and cooled in the air, and it is manifest that the quiet, steady, upward motion of the fat globules will be interfered with to a much smaller extent than in the other case. When the milk is set to cool in metallic vessels, in a cool atmosphere, the condition of the currents will be midway between the two cases already cited; there will be less interference with the upward progress of the cream than when the milk is set to cool in wooden vessels in the air, and more than when cooled in metallic vessels in the cold water bath.

In a metallic vessel set in cold water to within a few inches of the top, in a room where the temperature of the air is higher than that of the water, we would have, according to these principles, the most favorable conditions for raising the cream while the milk is cooling down to the temperature where we wish to keep it; we have then the least possible continuous upward and downward movement of the serum to interfere

with the upward passage of the cream globules; the uppermost layer of the liquid above the cold water will be warmest, and specifically lightest, so that there will be no downward current started from the surface by cooling there to drag down the fat globules that have already risen, and what cream reaches the surface will remain there.

Further than this I do not think we can safely go with our theorizing; if, indeed, we have established anything with certainty by the speculations already ventured; we must wait till we have further and more careful determinations of the rate of expansion and contraction of the milk serum and the fats of milk with changes of temperature; we know that water expands more rapidly at higher temperatures, nearer its boiling point, than at lower temperatures; we know that milk, as a whole, expands more rapidly when heated than water does; but we know nothing as to the rate of expansion of milk serum, nor the manner of its expansion, whether uniformly or not, as the temperature rises; nor do we know whether the expansion of the butter fats is uniform or not; therefore we do not know whether there is a divergence between the specific gravities of the fats and the serum, as we go up or down in temperature, or whether the difference between the specific gravities is about the same at all temperatures within the common limits at which milk is handled; if this divergence increases as we lower the temperature, the upward push of the fat globule should increase as the temperature falls; if the divergence increases as the temperature rises, the upward push should be greater at higher temperatures; but where we know so little with positiveness, we can only guess, and guesses do not make a safe foundation for rules of practice.

Let us, then, turn our attention to the results of experiments on the influence of temperature on the rising of cream. I must, however, confine myself to the indication of the general drift of these experiments, except in the case of some more recent ones, where it may be sufficiently interesting to go somewhat into details, to compensate for the time consumed.

The results of all laboratory experiments and of all experience agree in support of the law that the higher the temperature of creaming the thinner is the layer of cream, the more compact it is and the richer it is in fat; when, however, we come to consider the relative completeness of the separation of the fat from the serum, we find no such unanimity in the indications of the results of experiments, or in the current statements of experience. There is no temperature uniformly indicated as the best for the most complete separation of the two parts of the milk. It is only within the last fifteen years that any careful experiments have been made with respect to this matter; and it must be confessed, on looking over the records, that there is room yet for further investigation; but, so far as the results of these experiments go, they seem to show very plainly that the separation of the fat is more rapid and more complete at

low temperatures, in the region of 40°, than at higher temperatures. This would seem to indicate either that the greater friction that, as shown in the first part of this paper, should retard the motion of the fat globules in the colder milk, is really of no account, or else that, for some reason, the upward push of the globules is so much greater at the low temperatures as to more than counterbalance this increased friction. A French chemist, Tisserand, has recently performed some experiments bearing on this point that have attracted considerable attention. In the first place, he found that the greatest density of milk is at a point a little below the freezing point of water; this point has been confirmed by Fleischmann; therefore, the behavior of milk is different from water, which contracts as the temperature falls to 39°, and then, as it cooled still further down to 32°, steadily expands. Tisserand found also that, while the fat globules are of an oily consistence at 98°, at 64° they are semi-fluid, and at about 54° they begin to harden, but without any perceptible change in volume accompanying these changes from the liquid to the solid state. He concluded, on the basis of the results of a large number of experiments, that when the milk was quickly cooled to 36°, the separation of the cream was almost complete in one hour. The cream thus obtained was very bulky and thin, but on further standing it contracted in bulk and became thicker. So quick a separation of the cream was obtained, however, with a very small quantity of milk, that could be quickly cooled down; with more milk, 40 quarts in one vessel, twelve hours were required for the cream to rise to the same extent as in the smaller vessel, while thirty-six hours was required for the same quantity of milk to send up its cream at 60°. Tisserand found also that while milk standing 52 hours at 60° retained 17 per cent. of the fat in the skimmed milk, milk which stood for the same length of time at 36° retained but 6.5 per cent of the fat; all the rest was thrown up in the cream. As might be expected, then, he obtained a much larger yield of butter from the same amount of milk standing at low temperatures for the cream to rise, as shown in the following table; the milk in all the trials was allowed to stand 36 hours, the quantity of milk is given in quarts required for one pound of butter:

	Temperature.	*Quarts Milk.*
No. 1	36°	10–10.5
2	39°	11–11.5
3	43°	12
4	48°	12–12.7
5	52°	13–13.5
6	57°	14–15.4
7	72°	16–17

The butter made from cream from the cold milk was finer and of a firmer consistency, possessed a more delicate flavor, and kept better than that made from milk which was kept at from 55° to 68° for the cream to rise; and the cheese made from the skimmed milk in the former case was

better, and kept better. These results obtained by Tisserand add confirmation to those obtained by other investigators, while they extend the range of observation on this point of the influence of temperature on the rising of the cream, to a lower degree than before. It is hardly to be wondered at that Tisserand urges French dairymen, who are accustomed to set their milk at 54°, not merely to adopt the Swedish system of setting the milk at a lower temperature, but to go even further, and cool the water of the coldest spring with ice, so as to bring the milk down as near the freezing point as possible. One of our own dairymen, and a careful observer, expresses it as his opinion that the nearer the milk is brought to 32° the more rapidly the cream collects at the surface. The view prevails among many German dairymen that when the milk is cooled down to from 35.5° to 36°, all the cream rises in 12 hours, or that at any rate so little rises after that, that it does not pay to let the milk stand longer.

Fleischmann gives his full adhesion to the view that it is better to set the milk at very low temperatures, partly because it appears to be very plainly indicated that the yield of butter is greater, and partly because the evil results of any failure in perfect cleanliness in handling the milk, or any defect in the quality of the milk itself, is so much less liable to manifest itself to the injury of the butter; and at such low temperatures there is very little danger of any putrefaction to give rise to products that might taint the butter.

I think that the experiments of Tisserand need to be repeated before we can fully believe that it is best to resort to cooling down so near the freezing point, since in other experiments performed by a Swedish chemist, no cream at all rose in the first six hours when the milk was reduced down to 32°.

It appears from what has gone before, that while laboratory experiments have given us certainly some very valuable hints in regard to the solution of the important question as to the best temperature at which to set milk for cream, they do not enable us to solve it to our perfect satisfaction. Are we able to fill the gap by reference to the results of experience as applied in the current modes of practice among dairymen? The controversies of the day in which these dairyman are engaged, and the discussions in the dairy columns of agricultural papers, and in meetings of dairymen, answer my question. From these discussions it appears that dairymen may be classified as high temperature and low temperature operators, and that all the high temperature men do not set their milk at the same temperature; they range all the way from 58° to 68°. But while a 68° man, no doubt, sticks very carefully to his temperature, and the 58° man to his, I think it is an open question whether between these limits it makes much difference how warm or cool the milk is, other circumstances being the same. Of course, the low temperature men make strong claims for the advantages of their process,

and they find abundant support in the adoption of the Swedish system in Germany and other parts of Europe. But there are high temperature men there as well as among us, nor do they agree together any more closely than do ours.

Among the different systems prevalent in Europe, we notice the *Dutch* method in which the milk is cooled down to 60° in a water tank, which requires usually from one and a half to two hours, and the milk is then set to the depth of four or five inches in a room where the temperature ranges from 54° to 60°, and remains about twenty-four hours; the *Holstein* method, in which the milk is set at about the same temperature, without being first cooled in water, to the depth of one and one-half to two and one-half inches; the *Devonshire* method, described as long ago as 1784, where the milk is put in a cool room, standing at a depth not greater than from three to four inches for twelve hours; the vessel containing it is then set over the fire and heated till blisters begin to appear in the cream, or to about 200°, when it is set aside again for twelve hours; the cream is very firm in consistency and can be made into butter by simple kneading, and has a sweet, pleasant taste. Mueller states that the skimmed milk does not retain more than one per cent. of cream; the Gussander method makes no account of the temperature, except that it shall not exceed 61°, so that no milk cellar or but only a light, dry and airy room is required; the milk is put in large shallow pans, filling them to the depth of not more than from one to one and one-half inches; the milk is skimmed after twenty-three hours; in such a thin layer the milk is so well aerated that it remains sweet to the end, and the cream is sweet and very rich in fat.

As to the methods of the low temperature practice I need say but little, as all its details have been rendered so familiar to you in the course of the past few years. Fleischmann observes, in regard to it, that the temperature of the milk is usually kept between 30° and 42.50 and that in some dairies the best results are obtained at about 45.50—that the temperature of the room should be higher than that of the water of the bath, but should be reduced in temperature as rapidly as possible.

It is plain enough that out of all this diversity of opinion and practice, it is impossible to select any one temperature and method of setting the milk that all will agree upon as best; but never before was this important subject so widely discussed as now, or so much careful investigation devoted to it, and even if in our day no agreement should be reached, these discussions and investigations cannot but lead to some progress toward better methods.

The temperature of churning would naturally come next for consideration, but we find here but little opportunity for such discussion, nor is any such wide range of variation of temperature found in practice as in raising the cream. Without doubt the use of the thermometer in churning is as important as in setting the milk for cream, and without doubt

there is a certain temperature to which it is best to bring the cream at the beginning of the operation, so that the inevitable elevation of temperature, produced by the friction in the churn, shall not have reached too high a point when the butter comes. This temperature, as Fleischmann states, depends on four factors:

1. The nature of the material from which the butter is to be made, whether sweet or sour milk, or sweet or sour cream.
2. The season of the year.
3. The form and arrangement of the churn.
4. The quantity of material in the churn.

For the allowable limits of temperature of the material when beginning to churn, he gives the following figures:

	Range of Temperature.	*Average.*
Sweet Milk	45.5 –47.75	46.25
Sweet Cream	52.25–59.	55.6
Sour Cream	45.5 –68.	61.25
Sour Milk	59. –70.25	64.6

He allows but little weight to the estimate for sweet milk, because so few experiments have been made in churning this material; nor have the figures in this case much importance anyhow. The other numbers are based on the actual practice in various localities.

It hardly need be stated that the temperature of the cream should be from two to four degrees lower for churning in summer than in winter, partly in order to keep the final temperature down sufficiently low in the warmer summer atmosphere, and partly because the butter fat produced on the summer's green fodder has a lower melting point than that produced on the dry feed of winter. To get butter of the same degree of firmness the temperature at which it comes should be lower in summer than in winter. During the churning the temperature rises, it was once supposed, because some chemical change took place in the material churned, but, as is now understood, only because of the friction between the cream and the sides of the churn, and between the particles of cream itself. Mueller churned some water half an hour in a churn in a cold room, and the temperature of the water was raised by seven degrees. Since it is the final temperature of the contents of the churn when the butter comes that is of great importance, care must be exercised to prevent this elevation of temperature from exceeding certain limits, three to four degrees in the case of sour milk or cream, or four to six degrees for sweet cream.

Beyond these few considerations, there seems to be little of interest in regard to temperature in the manufacture of butter that has not already been presented in the meeting of yesterday. The factoryman sometimes, at least, has occasion to test the milk that is brought to him in order to assure himself that it is genuine, unskimmed and unwatered milk. No method of doing this short of a chemical analysis has yet been proposed

that is not open to some objections, but of all the quick and ready methods that have been contrived, none, after all, gives such trustworthy results for the small amount of manipulation and trouble as that in which the density of the milk is determined by means of the lactometer, together with, if occasion requires, the estimation of the quantity of cream thrown up in a cream guage.

The defects of this method I have already considered in a paper read before a meeting of this association ; but since the information gained by it can, within certain limits and under certain conditions, always be relied upon, it will undoubtedly be used by dairymen in preference to any other method yet known, because of its simplicity. The examination of the milk of some thousands of cows in this country and in Europe has shown that the milk of a healthy cow, brought to the temperature of 60°, has a specific gravity not less than 1.029 ; if, therefore, with the aid of trustworthy instruments, the specific gravity of a sample of milk, and especially of the mixed milk of a herd, such as is brought to the factory, is found to have a lower specific gravity than this temperature, there is but one conclusion to be drawn from the result.

Some liquid lighter than milk has been added to it ; such a liquid may be cream, it may be alcohol or whisky, or it may be watered—least likely the first, most likely the last. Thus the lactometer, with all its defects, can tell us nothing but the truth when it indicates a density of the milk below this standard. But it may often be inconvenient to bring the milk to this temperature before testing it, particularly as the test must be applied without delay, and not to milk that may have been standing quietly for any considerable length of time, so that the cream has begun to rise ; therefore, in Europe, where the lactometer is much used for testing the milk that is brought into the towns and cities, the test is applied at whatever happens to be the temperature of the milk ; and then, by means of a little table that is sold with the instrument, the corrected reading is easily and quickly found for the standard temperature. It seems to me that such tables should be prepared for our dairymen, to correspond with the Fahrenheit thermometer, used here instead of the centigrade thermomter, for which they are now calculated.

For this test especially, as well as in the case of other applications of the thermometer, a fair degree of accuracy in the indications of the instrument is desirable, if not almost necessary. Believing it would add somewhat to the value of my contribution to the proceedings of the convention if I could give some authoritative statement in regard to the accuracy of the thermometers in common use among dairymen, I have carefully compared twenty-two instruments, selected at random from the stock of a large dealer in dairy supplies, with a standard thermometer recently imported from Paris, and with the following results :

1 at very low temperature.

Standard.	*Dairy.*	*Standard.*	*Dairy.*
35.8	37	38.5	41
35 8	37	39	40
36.5	38	39.2	40
37	38.5	39.2	40
37.4	39	39.2	40
37.4	38	39.6	41
37.4	40	40.3	42
37.4	40	40.6	42
37.5	40	40.6	42
37.9	40	41	42
38.3	40	41	42

Not one of the theremometers, therefore, indicated the correct temperature, all being too high, two of them indicating a temperature 2.5° too high ; that was the widest variation from the correct standard.

At other points where tests were made the temperature of the water was constant.

Standard thermometer 59°. Dairy thermometers—Three indicated the temperature correctly, two very nearly so—59.5; 14 stood at 60, 1 at 60.5, 2 at 61, 1 at 61.5, and 1 at 62.

The widest variation was three degrees, and all the thermometers indicated too high a temperature.

Standard thermometer, 89.6. Dairy thermometers—4 correct or nearly so; 11 stood at 90–90.5, and 7 stood at 91.

Standard thermometer, 149°. Dairy thermometers—1 stood at 146', 1 at 147, 3 at 148, 1 at 148.5, 6 at 149, 1 at 149.5, 4 at 150, 1 at 151.5, 3 at 152, and 1 at 152.5.

At the highest temperature tested some of the thermometers indicated too high temperatures and some too low; and between the lowest and the highest there was a difference of 6½ degrees; the widest variation from the standard was 3.5 degrees (above).

These tests go to show that if dairymen believe that their milk must have a certain temperature to within a degree or less when it is scalded, or the rennet is added in making cheese, or that the cream must have a certain, precise temperature in churning, they must demand greater accuracy in the thermometer furnished them. But I doubt whether a variation of two or three degrees from the true indication is of importance enough to make up for the higher price that must be paid for better instruments. Such as are now used are as good as they can be made for so little money.

Discussion at the conclusion of Prof. Caldwell's address:

Mr. Farrington, Jr., Pa.: What is the reason that milk taken fresh from the cow and made up is not as good as that which has some age—say ten or twelve hours?

Prof. Caldwell: I do not know that I can answer you. I suppose the process of ripening goes on like that of cream. It requires a certain age. Perhaps it is to allow the animal odor to escape.

Mr. FARRINGTON: I wish to state a fact in connection with this subject. It is asserted by some that butter made by Mr. Hardin's process receives no deteriorating effect from the milk being confined. I have examined samples of butter made in that way, and while in its texture, and in every other respect, it was almost faultless, it smelt of animal odor.

Dr. MOTT: There can be no question at all but that animal odor is injurious. I have known several to pronounce it cow dung. Analysis shows that the gases of milk are composed of carbon, oxygen, hydrogen and nitrogen.

Prof. ARNOLD: If you take warm milk, fresh from the cow, and cool it down, the animal odor will entirely disappear; but on heating it up again it will at once be manifest. There is an advantage in heating it, and that is to get rid of this animal odor. No person cares to eat a product having a cowy flavor.

With regard to the animal odor of milk, its condition and effects, I have probably spoken and written more on this subject than any other. It will not, however, be inappropriate to refer to a very interesting experiment in connection with it, and the conclusions to which it led.

Professor Caldwell suggested that its action was that of a volatile oil rather than a gas.

To test this suggestion I took a quantity of milk, and confined it a long time in a close vessel, that the odor might accumulate as much as possible. Then by carefully distilling and condensing in ice water as low as 35 degrees, I obtained globules of the oil, which at that temperature was as fluid as water, and emitted no odor, but on warming it a little it assumed the aeriform condition, and threw out a strong, genuine animal odor.

It satisfied me that the animal odor is very volatile. I will here refer to a method of testing or distinguishing between pure and diluted milk. Our present method is by comparing the specific gravity of whole milk with that of milk from which cream has been taken or to which water has been added. Dr. B. W. Franklin, of Ithaca, N. Y., has recently discovered another mode of distinguishing between pure and watered milk by means of the difference in conducting power between fat and water, fat being a feebler conductor than water. The following letter will explain his mode of operating:

ITHACA, N. Y., Jan. 1st, 1878.

PROF. L. B. ARNOLD, Sec. A. D. A.:

DEAR SIR,—I have been experimenting for a few days in testing milk, In looking for a test by which I can invariably distinguish watered from pure milk I reason thus: The butter globules in milk being solid bodies of fat, must have a power for conducting heat different from that of the water in milk, and this difference of conducting power might be used to determine quite closely the relative quantities of fat and water in a given sample of milk. I have experimented on this hypothesis, and, if I am not mistaken, have found an easy and inexpensive way of distinguishing between pure and watered milk.

My first experiment was thus made: I took a spirit thermometer and three common tumblers, filled one half full of water, one half full of milk (which I knew to be pure), and the other half full of milk and water equally mixed, and reduced the contents of all three to the temperature of the room, which happened to be 60°; then, over a moderate flame of a spirit lamp, I warmed the bulb of a spirit thermometer till it indicated 80°, and then plunged it into the water. In two minutes it sunk to 60°. The bulb was again warmed to indicate 80° and this time plunged into the milk and water, when in two minutes it fell only to 62°, or fell 18° in two minutes instead of 20°, as before. Warming the bulb as before and plunging it into the pure milk it fell in two minutes to 64°, or only 16° in two minutes; the loss of temperature being governed by the amount of cream as compared with the water. I have repeated this experiment several times with a wonderful uniformity of results. I wish you would experiment and let me know your conclusions. It is essential that the temperature of the room and the contents of the tumblers be alike. This evening I shall test cream, when I shall expect to find a conducting power varying with its amount of fat.

Respectfully, B. W. Franklin.

Mr. Farrington, Pa.: The question of testing milk has long been a hobby of mine, as all who are acquainted with me well know, and I believe that every factoryman here feels that it is a vital question. Some ten years ago, in connection with the trial of a man accused of watering his milk, of whose guilt there was little doubt, although he was acquitted by the jury, every factoryman's good sense was insulted by the report that was published all over that the lactometer was a failure. Since then, however, other trials have taken place, at which intelligent jurymen have accepted the indications of the lactometer as evidence sufficient to convict; and I believe that Prof. Caldwell, and all who have examined the question, accept, for all practical purposes, the indications of the lactometer as reliable and sufficient without any corroborative testimony.

Prof. Engleharbt: I would ask Prof. Arnold whether the comparative specific gravity method is reliable.

Prof. Arnold: I hope gentlemen will not be led astray. The limits of variation of whole milk is known to range from 1029 to 1032. If the specific gravity of milk tested was between these limits it would not convict a man.

At this stage of the proceedings Mr. Wire suggested that some action be taken with reference to the death of Colonel Harris, and moved that President Cannon, etc., be appointed to draft resolutions with reference to the death of that lamented friend. The resolution was adopted, but the proposed resolution was not presented to the convention.

On motion, the convention adjourned till 2 o'clock P. M.

Afternoon Session.

At the appointed time the Convention re-assembled, with Mr. Cannon in the chair.

"WHAT LACK I YET?"

The first subject of the afternoon was the one entitled "What Lack I Yet?" upon which an address was delivered by Hon. Harris Lewis, of Frankfort. He said:

When our Lord was on earth a young man came running to Him, and in apparent deep concern asked the question: "What good thing shall I do to inherit eternal life?" Our Savior answered, "Thou knowest the Commandments: Thou shalt not kill; thou shalt not commit adultery; thou shalt not steal; thou shalt not bear false witness; honor thy father and thy mother, and love thy neighbor as thyself. This ruler in Israel, conscious of his integrity, and self-satisfied with his morality according to law, answered, "All these things have I observed and kept from my youth up. 'What lack I yet?' "

It is well for us to pause and ask ourselves, as dairymen, "What lack we yet?" Although the past has been a season of general prosperity to farmers as a class, and to cheese dairymen in particular, yet we may not continue to receive paying prices for our surplus productions, as we have during the past season. Do I lack a love for my business? If I do I lack the foundation of success. No man can fully succeed in the conduct of any business, in the pursuit of any profession or object, without that degree of love for which it carries with it enthusiasm. The details of any business we dislike will be neglected, and never attended to when they should be, nor in a proper manner. How often do we see men of more than ordinary intelligence leave their business to the care of others (however incompetent) or to care for itself, while they seek for company in places where intoxicating drinks are sold, and where games of chance are played? We often find men not in love with their occupation making the most flimsy excuses for neglecting it.

If we lack a love for our occupation we lack nature's qualification, which is the gift of God. I lay it down as an axiom that a qualification by nature, aided by study and practice, is necessary to success in anything we undertake. If I lack a love for my occupation I shall not be inclined to give it much study; and as proof of this, many dairymen, during this meeting, within the radius here represented by you, will spend their time sitting on drygoods boxes, in stores, on sugar barrels at the groceries, lounging in saloons and in bar-rooms, or what is worse, playing games of chance for drinks!

Ask those men to attend the meeting, and they will tell you they cannot for want of time, or that they can read the report in the papers, or perhaps they will say they understand the business well—know all about it—and that what they don't know ain't worth knowing. I have heard all these reasons given by dairymen who did not love their business, for not attending these meetings, where they might obtain the most knowledge of their business in the shortest time, and for the least money.

We all know these same dairymen have lots of time to spend from

home, especially just at milking time, and that they *never* take a paper. If they read one it is borrowed. Of their knowledge we have nothing to say—modesty forbids; but we may quote what another said; "Seest thou a man wise in his own conceit, there is more hope of a fool than of him."

Again, if I lack a love for my business, I lack all system in its management. Whatever I do I do it because it must be done, but never do it until the last moment in which it can be done, and do it then in a careless, slip-shod manner. If I lack a love for my occupation to that extent which renders its study irksome and its necessary labors onerous, I belong to that class who are commonly known as unlucky. As dairymen and dairywomen, it is well for each of us to ask ourselves the question, "What lack I yet?"

Does the farm upon which I am conducting the dairy business lack any essential thing to make my business, if properly managed, a reasonable success? Will it produce an abundant crop of good, nutritious grass? or does the soil lack some element which I can easily and cheaply supply, thereby rendering a good crop of the nutritious grasses almost a certainty in good, favorable seasons? Do I, in my practice, make ample provision for unfavorable conditions beyond my control, such as drouths, &c.? Does my farm lack an abundant supply of good running water, from springs or brooks, easily obtained by the cows, Winter and Summer? Or do the cows wallow through filth and mud to obtain their drink in Summer, and stand on their heads to obtain it at the spring, or brook, as the snows accumulate during Winter? If my farm lacks the elements for the production of good grass, and is destitute of good pure water, to that extent that a reasonable outlay will not supply the one and provide the other, it will be better for me to change my business, or exchange my farm for one better suited to me.

Do I lack a herd of cows best suited for that particular branch of the dairy business in which I am engaged? If I do, that lack can be easily and cheaply supplied by the introduction of that particular breed best suited to my wants.

These various breeds have all been brought up to their present state of usefulness and perfection at a great cost of time and money, and can be obtained now by dairymen at very moderate prices.

The Ayrshires, Alderneys, or Jerseys, the Devons, Holsteins and Shorthorns, each and all have their special and particular value and fitness for the different branches of the dairy, and a special adaptation for various localities. The Native cows (so called), constituting about nine-tenths of all our dairy cows, will, from their cheapness and numbers, constitute the principal foundation for improvement in our dairy stock.

Calves, from our best native cows, got by thoroughbred males, of that breed best suited to our respective wants, will cost but a trifle more, per head, than the natives, pure and simple. In presenting to you the im-

portance of improving our native stock for dairy purposes, I do not ignore the fact, that we often find among them individual cows of superior excellence; but when we attempt to breed from one of these superior cows with like stock, she seldom transmits to her offspring her own good qualities. Hence, it is often remarked, that good cows produce poor calves. When the superior cow has obtained her excellence from some near or remote class, it is not sufficiently inbred or fixed to enable her to transmit it to her progeny.

I do not urge our dairymen who never attend a dairymen's meeting to attempt any improvement in their herds. The effort would be useless, the time and money thrown away. The natives are best for them, as they will live on the smallest amount of poor food, endure the meanest treatment ever bestowed by the most brutal man upon his animals, and still some of the most hardy live and make some return.

Does my herd lack an abundant supply of good nutritious food? or do I seek to winter and summer my cows on food from which good pure milk cannot be produced.

Do I lack that skill and care, in the manufacture of butter and cheese, that secures for them the highest price on the markets?

It is unfortunate that some cheese makers can and do make good fair cheese from poor milk; but it is a much greater misfortune for us that so many cheese-makers can and do make poor cheese from good milk. The very fact that some persons do make better cheese from skim milk than others do from whole milk, has demoralized a great many cheese-makers, and has a tendency to depreciate the value of all the cheese made, by the too generous use of the everlasting skimmer.

Do we lack a market for our constantly increasing dairy productions? Have I done, and am I doing, all I can to establish and sustain our boards of trade? Do my dairy products possess those qualities that attract buyers at the highest market price?

If they do not, it will be better for me, and for the general interests of darying, to abandon the business, or improve the quality of my goods.

Do I as a cheese-maker lack a full set of skimmers, by which I can skim my milk at the top, at the bottom, and all around the sides before making it into that quality of cheese which nobody likes?

Let us bring this matter of skim cheese home to our very doors. Is there a man, woman, or child in this assembly, in this village, in this county, in this State, that prefers skim milk cheese to whole milk cheese? If I were to make a cheese for any one of you here to-day, would you ask me, as a favor to you, to take all, or any part of the cream off the milk, so that you might be sure of a good cheese?

I do not know a man or woman in this wide world who prefers a poor skim cheese to a good full milk cheese. I go further. I never knew a rat, or mouse, so destitute of good sense, sound judgment or refined taste, as to prefer skim cheese to whole milk cheese.

We do lack a sufficient quantity of good cheese to supply the foreign markets and home trade, and while as a rule the best is sent away, the poorest is kept at home, and sold to dealers at a less price to be used here. This practice may be continued until we *wholly lack* a home market.

While we have made a great improvement in the quality of our butter and cheese within the past fifteen years, we do not lack the opportunity for much greater improvement.

Many of our cheese makers still lack a knowledge of their business, and proper curing rooms in which to ripen their cheese. Many of our butter makers lack a knowledge of their business to that extent that their butter is not good when new, nor does it improve its quality with advancing age. Finally, the greatest lack found at our butter and cheese factories is pure milk, delivered in its best condition for the manufacture of butter and cheese. This lack can be traced to the ignorance, indifference, or want of care, found chiefly among that class of patrons who never attend a convention like this, who never buy or read a newspaper or book devoted to their calling, and published for their especial benefit. Would it not be right—would it not have an enlightening effect upon these patrons to divide the milk and make up the good by itself and the bad by itself, so that each class would have the just reward of its own care and labor. Under our present system of butter and cheese factory management the careful, painstaking patron is grossly ignored by mixing his good milk with that which is good-for-nothing, and ought not to be received. At the same time, and by the same operation, the patron furnishing bad milk is rewarded for his want of care. I know there are patrons located between two factories where both managers bid for the milk, where the patron is astride the fence, ready to go either way with his milk, yet apparently indifferent in regard to which way he goes until he gets the highest bid. These patrons are the masters of the situation, but would not be if I was in place of either manager.

How long will our factory managers lack the nerve and backbone to do right between their patrons? How long will they fear to hold the scales of justice evenly balanced between man and man?

The Chairman then announced the following committees:

Committee on Nominations—Harvey Farrington, Canada; R. P. Cannon, Ohio; Eastburn Reader, Pennsylvania; Lorin Green, New York; W. B. Straight, Ohio; Wm. A. Johnson, New York; J. B. Lewis, New York.

Committee on Finance—E. G. Ellis, Ohio; S. A. Farrington, Pennsylvania; F. E. Englehardt, New York.

Committee on Dairy Apparatus—Alexander McAdams, Ohio; S. E. Carter, Ohio; S. A. Farrington, Pennsylvania.

SOILS AND GRASSES FOR THE DAIRY.

A letter from Prof. N. J. Townsend, of the Ohio Agricultural College, who was expected to read a paper on this subject, was read by Mr. Horr, in which he regretted his inability to be present.

Mr. Horr made a few remarks in connection with this subject. He said: In riding through the country I have observed innumerable patches of thistles, docks, and weeds of different kinds, in fact, in some cases almost as many weeds as grass. What a tremendous waste? These, with proper exertion, could be eradicated in two or three years. Such is the apathy and mismanagement displayed that in some localities the business is almost ruined.

Mr. Cannon introduced Mr. M. B. Bateham, of Painesville, who, he said, had long done good service in the promotion of agriculture and horticulture in Ohio, and would say a few words about pastures and grasses.

Mr. Bateham said:

"All flesh is Grass," and President Grant uttered a plain truism when he said "agriculture is the *groundwork* of our national prosperity." And so our dairy pastures are the basis of prosperity in the business which this convention is aiming to promote, and improvement in the production of the raw material is quite as much needed as in the finished article of commerce. For several years past he had heard dairy farmers of the Western Reserve say that their business was becoming unprofitable, owing to the gradual decline of the pastures and the increasing severity of drouths, rendering it necessary to use nearly twice as much land as in early times for a given number of cows. Having occasion the past Summer to spend some time among the farmers in the older dairy sections of the Reserve—the Counties of Ashtabula and Geauga, with portions of Lake, Summit, and Portage—he made particular examination and inquiry respecting the extent and causes of the decline in the productiveness of the pastures, and what he learned fully confirmed what had been told him as to its extent and the meagre profits resulting to the generality of the farmers; and he was convinced that the chief reason why no larger number of the dairy farmers were present at this meeting was the fact their means are too small to allow of such expense as would be incurred in coming and spending two or three days in the city.

In confirmation of what had been told him by dairy farmers, he found that the statistics of the several counties, furnished annually by the assessors, showed a large decline in the productiveness of the pastures. Commencing only nine years ago, when the amounts of pasture land began to be reported along with the number of the different kinds of stock, we find that while the number of cattle at that time was nearly the same as now, the number of sheep was from 20,000 to 60,000 per county greater, and yet the number of acres of pasture at that time was much less than now, the returns showing an increase in eight years of about

20,000 acres in Geauga County, and 30,000 in Ashtabula. If we count eight sheep as equivalent to one cow, we find by the statistics that eight or nine years ago the average capacity of the pastures was one cow to three acres, and now it is only one to four acres—a very large decline for so few years.

These dairy lands are generally level, or slightly undulating, the soil clayey and not deep, though originally quite rich with decomposed vegetable matter on the surface. Grass flourished finely so long as this surface fertility lasted, and while the roots of the forest trees which permeated the soil were gradually decomposing, allowing the grass roots to descend in their places. But after a period of eight or ten years these sources of fertility became exhausted, and the tramping of cattle, while the clay soil was wet in Spring, caused it to become very hard when dry, and the roots being unable to penetrate downwards, or finding no nutriment there, could only spread near the surface, and hence perished in times of drouth.

Another cause of the failure or decline of pastures is the common practice of over-stocking, turning on the cows too early in spring, and keeping them on too late in the fall, besides feeding off too closely all the season, thus allowing the grass plants no opportunity to make good foliage or strong roots. Every intelligent farmer understands that leaves are necessary for the growth of roots; and even Canada thistles are soon killed by keeping the tops cut off. Then, who can wonder that these bare and hard-tramped pastures soon fail in times of drouth, or that the nutritious grasses are so largely supplanted by weeds or "poverty grass" (*Danthonia*), which cows will not eat.

Most of these pastures have never been plowed, as this cannot be done with advantage without a good deal of enriching before re-seeding. Hence it is not possible that the soil has been largely robbed of its mineral elements of fertility, excepting at the surface. And it is found that all of these clay soils can be made highly productive, and kept so, by a judicious system of tillage and rotation of crops, with moderate manuring. Some experiments have been tried with various kinds of fertilizers as top-dressing for pastures and meadows, as lime, ashes, superphosphate and bone-dust; and from all that had been learned of the results, but little benefit had resulted from lime; ashes had done much good where the soil was less compact and clayey than the average; superphosphate was quite beneficial on meadows, and when seeding with wheat and grass, but on the whole, did not seem to pay as well as the bone-dust. This last, when pure and finely ground, like the sample exhibited here, from the mill at Salem, O., had been tested by a number of dairy-farmers and others within the past two years, with such obvious results as to clearly indicate that the mineral elements most wanting in the old dairy pastures is phosphoric acid; and when we consider that this is a constant ingredient of milk and cheese, as well as the bones and flesh of animals,

it is easy to see how the limited supply in the soil may become exhausted —shipped off to Europe and elsewhere in the twenty million pounds of cheese annually exported from our State.

The remedy for this wearing out or decline of the dairy pastures must of course be found in plowing and enriching the soil, along with more of a mixed style of farming, and the use of green crops, as clover, etc., as manure, when the soil is sufficiently deepened and drained. Partial soiling of cows in summer will also need to be resorted to as a means of avoiding too close feeding and injuries from drouth.

A MIXTURE OF GRASSES,

when seeding for pasture, will be found of much advantage, instead of using Timothy and clover alone, and trusting to the more durable kinds to come in of themselves. English dairy farmers understand this, and use from 10 to 12 kinds of grass when seeding down pasture lands. Grasses differ in their roots as much as in their tops; some being very fibrous and creeping, near the surface, and others going more downward; so that a thicker and better turf is formed by a number of kinds together than by one or two alone.

Some kinds of grass start earlier than others in spring, and some are better than others in the fall, or stand heat and drouth better on account of deeper roots. The speaker advised sowing the following six kinds, as known to be adapted to clayey soils, and to the climate of northern Ohio: Timothy, Blue Grass, Red Top, Orchard Grass, Meadow Fiscue and English Rye Grass—adding white clover if desired. If either kind is omitted, it should be the rye grass, as it sometimes winter kills on flat clay soils. The fescue grass, though foreign, has been steadily introducing itself along the clay roadsides in northern Ohio for some years past, without human aid, and flourishes finely in moist places, if the soil is not too poor. It is esteemed as one of the best of pasture grasses in England, though cattle do not seem quite as fond of it as of Timothy or blue grass.

MILK PRODUCTION.

Professor E. W. Stewart then proceeded to deliver an extemporaneous address on this subject, as follows:

Mr. President and Gentlemen—

I wish to direct your attention to some specialties.

First—I would impress upon all dairymen the necessity of believing, as firmly as a churchman does his creed, that something never comes from nothing.

If they could only believe that whatever is produced in beef, milk, or wool must be produced from the food which the animal eats, a very great change would at once take place all over the country. There is not a movement made by any creature that is not compensated for by the food. This matter bears directly upon dairymen. If you allow your cows to go two miles, or one mile to pasture, or if you allow any one to

misuse them, you must pay for it in food. Every intelligent dairyman knows that chasing or dogging cows changes the quality of the milk. It becomes poor, defective in oil; the nervous excitement uses it up.

This illustrates the doctrine that all exercise must be paid for in food. There is not one degree of heat that is not produced by the food. If you expose your cows to a temperature fifteen degrees below zero, you must burn food enough in the stomach of the animal to overcome this intense cold. I want to impress upon you this great law of equivalents.

There must be something paid for everything. You cannot produce something from nothing. You must know that you have to support the cow first. She must live before you can produce any milk whatever. Some seem to think that if their cows live poor during the winter they will pick up in the spring, but this is a great mistake; it will require nearly all that a poor cow can eat to supply the wants of her own system.

Now, gentlemen, I want to call your attention to a fact that is of general interest, which is, that it takes two-thirds of the food you give the cow to keep her in fair condition—her food of support—before you get any milk production. This has been tested. I have tested it in a number of instances. I do not mean to say that all animals thus use up two-thirds of their food; but as a general statement, two-thirds of the food goes to keep the animal alive. Up to that point you make nothing.

A growing animal, that weighs four, five or six hundred pounds in the Fall, and weighs the same, or perhaps a little less, in the Spring, is more than unprofitable. The food required to keep it over is utterly thrown away. You have as effectually lost it as wood that had been burned in your stove. All you have left is its droppings, as also the ash from the wood. Now, you must remember that all your profit, if you get any, must come from the extra third of food you give the cow, and if your are so stingy as to refuse that, besides the cost of keeping the cow, you lose all profit.

In regard to milk production the cow is simply a machine to produce milk, precisely as much so as a steam engine is a machine to produce motion or power.

If you give the steam-boiler no more than enough fuel to just warm the water, you get no power. Your boiler must have fuel to produce extra heat before you can do any work.

It certainly makes considerable difference what kind of a cow you use to produce milk, just as it does the kind of boiler and engine you use to produce motion and work; and therefore it is important that in purchasing and breeding cows for dairy purposes that you look to the capacity of the cow to turn food into milk. But without generous and judicious feeding breed is of little consequence. If your cow produces only 3,000 pounds of milk a year, the cow is kept at a loss.

Thirty or thirty-five dollars will only pay for the food she eats. It costs

about seven-eighths as much to keep that cow as it would one that would produce 4,000 to 5,000 pounds. So that a man who neglects to select his cows, and refuses that extra one-eighth, loses all chance of making a profit. Unless abundant food is given, you will not receive anything worthy of your labor. Dairymen do not study this question as they should. Full feeding requires that the farmer shall provide some green food to carry him over a dry time, when the pasture becomes short. This he may do in one way by sowing corn. It is, no doubt, one of his best reliances. My friend, Mr. Lewis, raises a large amount of mangels. They are very succulent roots, and I would recommend them wherever they can be produced cheaply. The great advantage of corn is, it will grow almost anywhere. With respectable cultivation you may raise 24 tons of green fodder an acre on an average.

Ques. What kind of corn would you recommend?

Prof. STEWART: The different varieties of sweet corn, and also the common kind, I would recommend an early sweet corn for early use, and then Stowell's evergreen will come in last. It is very succulent and full of sugar, containing the elements to produce milk, though not all in the right proportion; in fact, we have no one food which is perfect in nutrition, containing all the qualities necessary to make it normal food.

Oats and peas combined are nearly a normal food. The pea is very rich in albumenoids, as well as oats; although they do not ripen precisely together, yet they mature near enough together for green food. I would begin to feed them just when the pea is forming in the pod, and continue whilst it remains green. You will find the cow will vote for this green food every time.

Hungarian grass is an excellent milk producer. To do, well, however, it requires a finely pulverized soil.

I want to impress upon you the importance of using oats and peas. Corn meal is an excellent food to produce milk if you combine with it a portion of oil meal to balance up the constituents. Carbon and water alone will not grow bone and muscle, you must have more albumen. Oats and corn ground together, bushel for bushel, forms an excellent ration. You can scarcely find a better food. There is a great deal of loss in feeding the cow as if she had but one stomach instead of four. If you feed meal alone it will probably go at once into the fourth stomach and will not be raised for re-mastication, and you will find a streak of yellow in her manure. I once tried an experiment with ten cows, giving each cow three quarts of corn meal per day, fed alone. This was continued for a month. For the same length of time I fed them the same quantity of meal, mixed with one peck of moistened cut hay. In both cases they had all the hay they chose to eat. I weighed the milk and the result showed a gain of 25 per cent. in favor of mixing the meal with cut hay.

Ques. Was it fed raw or cooked?

Prof. Stewart: It was raw, and fed wet. I am always ready to acknowledge my mistakes. I will say here, that if meal is fed alone, it is better to feed it dry than wet, as it becomes better mixed with the saliva, which is an important agent in digestion. By mixing the meal with cut hay, it all goes to the first stomach, and is raised for re-mastication.

By cooking hay you bring it back nearly to its original condition of grass. For the encouragement of those who keep a large stock, I would remark that you can cook the food at a very small percentage of cost to each animal. It would not pay if you have but five or ten cows, for nearly the same labor is required to cook for ten as for thirty or forty. If you have suitable arrangements, by the aid of machinery, one man alone will cut, cook and feed the fodder required for one hundred cows. It would require an engine of, say, eight horse-power.

You may have your straw, clover or corn fodder conveniently stored, so that one man can feed and cut, and by a very simple carrier it can be conveyed to the steam-box, which is in the form of a barrel, hung on trunnions at each end, so that it can be revolved.

The fodder is carried and falls into a mixer over the steam-box below, and when the box is full, it is pressed in solid, water being supplied from a pipe at the rate of two gallons to every five bushels of straw or hay. The meal or grain is conveyed in a spout from an elevated bin, in just the proportion desired. The mixer mixes hay, water and meal together, and it falls into the steam-box below. It is all done by machinery. In one hour, one man can cut and mix and fill a steam-box large enough to feed one hundred cows; and in another hour, or hour and a half, he will cook it.

A gentleman who raises much corn, told me that he made an experiment, in order to find out how much an acre of corn was worth. He fed it when soft, in the roasting state, to one hundred and four cows, in October, in stables, and it lasted them four days. That is equal to feeding one cow four hundred and sixteen days, If you have a cooking apparatus, I will give you another good way of using corn, after it is ripe, without husking, shelling and grinding. Take it from the shock, run it through this straw-cutter, stalks, corn and all, cutting it very short, a thin shaving of an eighth of an inch in length, run it into the steam-tank, mixed with water, and steam it till it is soft, and you will get all the profit from it that you would after husking, shelling and grinding.

Ques. How much does it cost to raise an acre of corn?

Prof. Stewart: It depends very much upon circumstances. Some say they can raise it at a cost of ten dollars an acre. I never could do it for that. It costs less money to winter your cows upon corn in this way than upon hay or any other food that I know of. The day is certainly not far distant when all enterprising farmers will soil their stock to a great extent. The best way to soil is to begin raising grain. Make a calculation as to how much corn and other grain crops you will require, raise

good crops, and you will soon see the folly of using three to five acres to pasture a cow, when she can be soiled on a half acre.

Ques. Have you had experience with rye?

Prof. STEWART: Rye is a little better than corn for green fodder, but not as good as grass; not as good as clover. It, however, comes earlier in the Spring than corn, clover or timothy, and it may be cut several times in a season. I believe in saving labor when it is possible or judicious. I have contrived a self-cleaning stable, which so far appears to work well. It certainly is very satisfactory to the men whose business it was to clean it. An iron grating is put in for the hind feet of the cows to stand upon. The fore feet stand upon planks. This grating is composed of bars of iron resting upon iron joists. The iron joists rest on an angle iron sill, at the back side of the platform, and the other end upon a wooden joist under the plank. The bars lying across these are an inch thick and 1½ inch wide, and are placed 1⅝ inch apart. The platform is raised 12 inches, and the gutter sunk 8 inches. The droppings all pass through into the gutter below. No manure or urine remains to soil the cows. The manure which had previously accumulated on their flanks, began at once to disappear. I was afraid the cows might slip on the bars, but my fears were unfounded.

Ques. What was the cost?

Prof. STEWART: For twenty cows the iron, ready fitted, cost $70 only. I consider it will save that in labor in two years.

Ques. How do you fasten your cows?

Prof. STEWART: For a long time I have been convinced of the barbarity of the method of fastening their heads between two sticks or stanchions, but always practiced it till lately. I think I have now the best method. It costs but little.

Erect posts, 4 by 6, between each two cows, on each side an iron staple, 12 inches long, is driven firmly in. This staple is composed of ¾ inch rod. The cow is fastened in the center of this space by means of a stout iron chain, each end of which is attached to the staple, and slides up and down. The chain has a ring in the middle, and is fastened to a leather strap about the cows neck by means of a strong snap. By this arrangement the cow is able to lick any part of her body, and she does not plunge against the stanchions when she lies down or gets up. As far as I can see by their looks they give me an unanimous vote of thanks.

Mr. LEWIS: Will not the manure in the gutter ferment, smell, and be very unhealthy?

PROF. STEWART: In the winter, as a matter of fact, there is no fermentation in cow manure during three weeks whilst the gutter is being filled, and in the summer I shall mix dry earth with the manure to prevent all odor and increase the value of the manure.

Ques. How do you ventilate the stable?

Prof. STEWART: By having several spouts, 8 inches by 16, running

below the floor over the basement, and then up to the plates of the barn. Every other spout running down to within a foot of the floor of the basement, discharging cold air, and the upper ones warm air.

The Convention then adjourned till 7 P. M.

Wednesday Evening Session.

The Association resumed at 7 o'clock.

Mr. Real offered a resolution in favor of the remonetization of silver.

Prof. Arnold: I shall oppose this resolution on the ground that it is not an appropriate subject for discussion by this convention. Our association being nonpolitical in its nature, including among its members persons adhering to different political parties, all united here on a common ground, to advance the great agricultural interests of the country. It is, therefore, very inappropriate to introduce such a resolution.

On motion the resolution was laid on the table.

The chairman then announced the next subject for discussion:

FULL CREAM CHEESE,

And introduced Mr. S. A. Farrington, of Pennsylvania, who, on coming forward, addressed the convention as follows:

Mr. President and Gentlemen,—In justice to myself, I will inform you that until a few days ago I had expected to address you on another subject; I have, therefore, no written manuscript, and my remarks will, perhaps, be more or less incoherent.

I will first briefly trace the cheese manufacture from its infancy to the present time. Our exports of cheese, in 1840, amounted in all to about 5,000,000 pounds; the best dairies in Herkimer County receiving 4½ cents a pound. In 1845, some dairymen not being satisfied with the price received, formed a sort of Granger organization and sent a man to New York to learn the wants of the trade and sell their goods. That organization was successful and resulted in a complete revolution in the manner of manufacture and quality of the cheese. Their agent, who went to New York, found that much could be saved by making the cheese so that it would be ready for market in twenty or thirty days.

Cheese-makers were anxious to obtain a price equal to the best, and thus a healthy competition and enterprise was excited, and its manufacture and exportation greatly increased, so that in 1852 our exports amounted to 15½ millions, against five millions in 1845. Mr. Williams established the first factory west of Connecticut, in 1852. Between this date and 1863, many more came into operation. Up to this time the manufacture of cheese from sweet curd was mainly used. Acid was not practiced to any great extent. The acid theory was first discovered by accident. The cheese of one factory was found to pass through the hot weather and keep its place, remaining solid. Others were troubled more or less. The question arose, what made the difference? It was found

on an investigation being made, that the factoryman whose cheese kept its place had fed his whey to the cows, and the experiment was made of putting the whey into the milk, when the same result followed. This was the origin of the acid system. The manufacture and exportation has increased every year, until last year, from the 1st of May until the 30th of December, we exported over 103,000,000 pounds. This is indeed remarkable, and, at the same time, remunerative prices were obtained. The great improvement in the quality of the goods is, without doubt, the cause of this increased exportation. The English consumers have told us during all these years, "You can manufacture and furnish us cheese cheaper than we can for ourselves; and if you will only give us the quality we want, we will take all you can make." Canada, which thirteen or fourteen years ago was importing chiefly, from New York State, $200,000 worth annually, in 1875 produced 49,000,000 lbs. Put that with our own production, and you will see the immense increase since the factory system was organized. In regard to the quality of the goods produced, we find that English consumers want a close, firm, nutty, mild, well-flavored cheese, and they will take all that we can make of this class. But much of our cheese is inferior, do not satisfy English taste, and becomes a drag on the market. It is certainly suicidal for us to make such an article.

We should not only produce an article of cheese that will satisfy the foreign demand, but will also suit our own people.

It is stated on good authority that England consumes ten pounds of cheese to each inhabitant, while we consume only from 2½ to 3 pounds each.

Prof. Arnold and Prof. Caldwell will tell you that there is as much nourishment in one pound of good cheese as there is in two pounds of butcher's meat. If our people could be impressed with the fact that cheese is not only one of the cheapest, but also one of the most healthy articles of diet, how soon would the demand for it increase. We seem to forget how much we might do to increase the demand by making nothing but a good article. We seem to look too much for the present sixpence, instead of waiting for the future shilling. There is a wide difference between cured and dried cheese.

For some time after the factory system was established, the general opinion seemed to prevail that the rennet was simply a coagulating agent, and curing rooms were called drying-rooms. These being the views entertained, it is easy to conceive what the result would likely be. More recent researches, however, have shown that the influence of this coagulating agent goes on through the process of curing; that we are to depend upon the rennet as the digestive principle, operating upon the curd, very similarly as the milk is operated upon when received into the calf's stomach. It is therefore very important that the conditions,

favorable or unfavorable, for the proper influence or operation of this agent be properly understood.

Many manufacturers think that if they receive pure, clean milk, and use the best of skill in its manufacture, their work is over. If, however, the best manufactured cheese be put into a cold, damp curing-room, it will produce a poor product every time. I will now briefly describe the manufacture of whole milk cheese, first remarking that the amount of heat, and quantity of rennet used, will depend upon whether it is wanted to go into immediate consumption, or whether it is required to possess long-keeping qualities. The first condition is that the patrons of the factory bring good, sound milk in good condition, whether it is carried twice a day or only once. The practice used to be twice a day, almost entirely; now, in some localities, it is taken but once a day.

Night's milk, if not manufactured till morning, is cooled down to about 70°; some reduce it to 80°, and others as low as 60°.

The cream that rises during the night is taken from the vat before any of the morning's milk is put in, and run through the strainer with the warm milk, that it may be properly incorporated therewith. The whole is then heated to 84°, and sufficient rennet added to cause cogulation to commence in fifteen minutes, and the curd to become firm enough to cut in forty-five minutes. It is then cut by horizontal and perpendicular knives, which leave it in cubes one-half inch square.

Ques. Is that fine enough :

Mr. FARRINGTON: This is the general practice. I have heard of factories where they cut it as fine as wheat. After cutting the curd, heat is gradually applied. This is done sometimes by applying dry steam between the vats; sometimes injecting the steam directly into the milk or whey; others fill the space between the vats with water, and heat the water by discharging steam into it.

In any case, it must be applied very gradually; no portion is allowed to advance faster than any other. The curds float around in the whey like feathers. After raising it a few degrees, the steam is shut off ten or fifteen minutes, when it is again applied. The whole mass must be continually agitated. Some use the hands alone for this purpose, and some a small rake. The heat is thus gradually applied until it is raised to 98° or 100°.

Ques. Is not 94° sufficiently high to scald?

Mr. FARRINGTON: My experience is, and it agrees with what I was taught, that 98° is nearer the temperature of the normal condition of the milk, and, therefore, the more natural it works.

When working it as low as 92° or 94° I thought I lost cream from the curd being too soft. It seemed to retain too much water. I believe it is the generally received opinion that a given amount of heat is necessary to expel the water, and also, that in the manufacture of skimmed-milk cheese as much heat is not required as in that of whole-milk cheese. It

requires from an hour and a half to two hours to raise the temperature to 98°. The stirring is kept up and the whey kept on till, as we used to say, the acid is developed. The curd is tested from time to time with the hot iron. I am of the opinion that the acid has nothing to do with the stringing principle, but that it is simply the digestive process going on all the time.

Having determined when the curd is ready to take out, it is dipped into the sink and carefully stirred, enough to prevent its adhering, till it is sufficiently drained for salting. I would keep the curd as near 98° as may be, not letting it drop more than a degree or two, if possible, before salting, and in hot weather I seldom let it get below 80° before putting it into the hoop. I use a sink, cooler and drainer, with a wood bottom, the central portion of which is covered with perforated tin. It is then pressed about two hours, sometimes bandaged and dressed and left till next morning, when it is taken to the curing room, where it is turned, rubbed and greased, as occasion requires, till it is cured for market.

Ques. How much salt do you use?

Mr. FARRINGTON: From two and a half to three pounds to the 1,000 pounds of milk.

Ques. What test do you prefer to ascertain when the curd is ready to dip?

Mr. FARRINGTON: I would recommend going by the hot iron. I have not a more reliable test, especially if your milk is faulty.

Ques. How long would you have it string out?

Mr. FARRINGTON: From one half to three-quarters of an inch.

Ques. Do you take the milk once or twice a day?

Mr. FARRINGTON: We take the milk once a day. When it is proposed to make butter the cream is put into separate pails and weighed, and the patrons are allowed the same as milk. Most of the factorymen in Pennsylvania determined not to take any cream off.

Ques. How much salt would you use in spring?

Mr. FARRINGTON: Probably 2½ lbs. to the 1,000 lbs. of milk would be sufficient, provided the curd was reasonably dry. In the Fall we use salt sufficient to flavor the cheese.

On motion, further discussion of this subject was postponed till the morning session, when Mr. Farrington would describe the Cheddar process.

Mr. C. W. HORR, of Wellington, was next introduced, and spoke as follows upon the subject:

"HOW CAN THE PROFITS OF DAIRY HUSBANDRY BE INCREASED?"

I have studied with some care the papers that have been read at the regular sessions of this Association and other similar ones during the last twelve years.

While I have been greatly interested and profited by the hints and information that I have thus obtained, I have felt that too much time has been occupied in discussing different theories as to processes of manufacturing butter and cheese, and sometimes even in the discussion of questions that are theoretical rather than practical. Too little attention has been paid to the simple naked, inquiry, "How can the individual dairyman obtain a better profit from his business?"

It seems to be taken for granted that but little energy and skill are required for the judicious selection of a dairy of cows, or for the economical and successful management of the farm upon which they are to be kept; that a very little experience, intelligence and information will quite sufficiently qualify a man for the management of the cows after they are selected, and for the decision of all questions as to the character and quantity of food that will insure the most profitable results.

If the dividends of a cheese factory for a single season are lower by 10 per cent. than those of a contiguous one, the patrons of the former are enraged; and unless great inducement is offered them to continue their patronage another year, a rival factory is straightway organized, probably on the Granger plan, or else the milk is scattered to other factories. I do not mention this to complain, because success should always succeed, and I am not much in favor of forgiving poor work because of good excuses; but I mention this fact to increase your astonishment when I say to you that quite frequently dairies kept side by side, for a succession of years, annually show a uniform difference in yield of milk, both to the cow and to the acre, of 50 per cent., and occasionally of 100 per cent.

Yet the wife of the man whose cows are only yielding one-half as much milk as his neighbor's, still lives with him and seems to retain her affection and devotion. His children do not abuse him, but remain obedient. No application is made to the court to have a guardian appointed for him, nor to have him declared "*non compos mentis.*" While the factoryman who, for a single year, falls behind his competitors even by a small per cent. is condemned without trial; his patronage unceremoniously taken from him; his business ruined, and his buildings left to be the abode of bats and owls; the farmer, for ten years, may conduct his business with so little skill, energy and foresight as to produce 50 per cent. less milk to the acre, and to the cow, than his neighbors, without drawing upon himself the criticisms of his family or his friends, and without causing him to question his own industry, knowledge or capacity. However ready he may be with criticisms on the management of the factory to which his milk is taken, his own self-complacency will remain undisturbed.

Now, I wish, in plain language, to call the attention of dairymen to a few points that they have not hitherto properly considered. The real

difference in value between a good cow and a common or poor one is not generally understood, and certainly not fully appreciated.

A record should be kept by each dairyman, with his individual cows, so as to ascertain definitely the value of the product yielded by each. This is seldom or never done. Cows are bought hap-hazard, with too little pains, and after they are bought, they are milked till they fall from old age, without regard to whether they are worthy of retention or not. I milked last year seven cows, and weighed the milk from each enough times to ascertain with sufficient accuracy the amount of milk yielded by each. By an examination of my account, as shown on the books of Horr, Warner & Co., I find that I shall receive for the milk furnished from these cows, during the eight factory months, a little over $440; and, by figuring, I see that my various cows contributed to this result substantially as follows: Best cow, $92; second best, $80; third best, $75; fourth best, $60; fifth best, $50; sixth best, $43; seventh best, $40. The two poorest ones, however, were two-year old heifers. Leaving these out, there was $42 difference between the value of the milk yielded by my best and by my poorest cow, and both of them are young. The one giving the least milk looks to be worth the most money. But what is the real difference in their value? The average man, knowing all the facts that I do, would probably say $25, certainly not over $40. But I maintain that the cow that yielded $92 worth of milk is worth at least $125 more than the one that yielded but $50 worth. These cows can doubtless be milked six years longer, and during that time, should the same difference continue —and I see no reason why it should not—I should obtain from the one cow $250 worth of milk more than from the other. And one-half of this sum, it would seem, can reasonably be added to what would be the fair value of the cow, providing she was no better milker than the one with which I have compared her. If we contrast dairies instead of cows, we will find a striking, though perhaps not quite so large a difference, as when the comparison is made with individual cows. I will remark that during the past twelve years, the firm with which I have been connected has received the milk of a large number of dairies, probably three hundred on an average each year. As we have charged the milk-handling by the cow, we have known the number of cows kept by each patron. I have taken great pains to ascertain the average, the minimum, and the maximum yearly yield to the cow of our various dairies. A trifle over 6,200 pounds to the cow is the maximum, and somewhat less than 2,700 the minimum. Ten years ago the average was about 3,500 pounds to the cow. It is now just about 4,000; possibly a little over. The average value of the milk during the last five years has been about a cent a pound, so that our best dairies have produced over $20 worth of milk to the cow more than the average, and fully $35 more than the poorest. If you make the comparison by land instead of by cows, you will find a still greater variation. I know of one dairyman who, during the last

year, obtained over 1,200 pounds of milk to the acre, counting every acre of his occupied land; he bought some feed, but he produced fully $10 worth of milk to the acre, after paying for all feed purchased. In contrast with this, I can find within ten miles of Wellington, fifty dairymen, whose whole farms are devoted to the dairy business, who did not produce over $5 worth of milk to the acre during the same year. Counting the cleared land alone, I should think the average value to the acre of the annual product for the last ten years has been $6.50. To illustrate this point more fully, I will give from our books the proceeds of the milk of two 200-acre farms, lying within one mile of each other. Both have been wholly occupied with the dairy business during the six years covered by my figures, and neither has any natural superiority over the other. From 1872 to 1877, inclusive, the net proceeds of their milk sent to our factory were as follows:

	Mr. W's Dairy.	*Mr. —'s Dairy.*
1872	$2,106 58	$1,200 73
1873	1,646 94	872 95
1874	1,695 17	776 29
1875	1,556 76	867 12
1876	1,510 36	854 16
1877	1,609 04	923 38
Total	$10,124 85	$5,494 63

This statement shows that the one farm, during the six years, is $4,630.22 ahead of the other, or $771.70 per year, or $3.31 per acre, annually. The milk from both dairies during all this time went to the same cheese factory. Mr. —— has had as many years of experience as Mr. W., and is a man of more than average ability, and is highly respected as a neighbor and citizen; but is in easy circumstances, and unlike most Americans, not very anxious to get rich, and hence he has not put the energy and the effort into his business that his neighbor has. I would add, that I could show much larger contrasts by selecting from our books extreme cases. This great difference in the yield of milk to the cow, and to the acre, is mainly attributable to the following causes :

First. Difference in milking qualities of dairies.

Second. Difference in the milking and the care of cows.

Third. Difference in water and pasture.

Fourth. Difference in feeding, not only in Winter, but in the Fall and Spring months.

No farmer should buy a cow that, after careful investigation, he does not believe will bring him at least $50 worth of milk during the season. He had much better give away a cow, if he owns one, that does not give over $40 worth of milk per year, than to keep her during a series of years, even if he has to pay $70 or $100 for a five year old cow that will give $70 worth of milk a year. Poor cows are dear at any price ; really good ones, if young, are never sold too high. Great pains, then, should be taken in the selection of cows to obtain natural milkers.

But no matter how good cows the farmer has, unless they are carefully quietly and regularly milked, only indifferent results will be obtained. The utmost care should be exercised to avoid exciting the cows, either by blows or by the use of loud and angry words, or harshness of any kind. Fast driving, just before milking, should be avoided. It is much better to have the cows milked in the stanchions than in the open yard. In the barn, milking stools will less frequently be thrown at excited cows by more excited men. Although I am aware that many good dairymen will not agree with me, yet I protest against the use of dogs in driving milch cows. They certainly cause more excitement and running than would an intelligent, good-tempered man; and it is as difficult for a quick-tempered, ugly man to become a good dairyman as it is for a rich man to enter the kingdom of heaven. I will only add, in reference to milking, that cows should be milked quickly, but very clean, and special pains should be taken to strip the last drop from their bags, in the Fall.

Not only should the bull be kept in the barn or a separate pasture, but as soon as a cow is observed to be in heat, she should be put by herself; of course, she should be liberally fed, so as to prevent, as far as possible, temporary shrinkage of milk.

But little need be said in reference to water and pasture, for we are all reminded about three times a day of the physical necessity of eating and drinking; and it is quite as necessary that a cow should have abundance of good food and water in order to do her work of producing milk well, as it is for a hard working man to have wholesome food and drink. Even the best cows cannot make milk out of air and parched herbage. They have none of them the trick of converting thistles, mullen-stalks and wheat straw into milk; nor can cows fulfill their mission fully as milk producers, if they are compelled to exhaust their physical energies in seeking their food or drink. Abundance, then, of good wholesome food and water should be furnished your cows, without compelling them to spend the whole day in traveling for them. If your pastures, by reason of drouth or for any other reason, fail to supply both of these, you must furnish them at your barn.

This leads me to the fourth topic: Feeding, not only in the winter but in the fall and spring months. I have not the time to give, as fully as I would like, the facts upon which I base my conclusions as to feeding, but will briefly state my conclusions and a few of the facts upon which I base them. It is very important that cows be wintered in warm barns. At least one-third less feed is required to winter a dairy property that is well stabled, than one that is not housed. Farmers will find it more profitable, I think, to feed more grain and less coarse feed in the Winter than is the usual custom.

Cows should be generously messed from the time they calve until flush of feed, and for the good of the pastures as well as their own, they should

not be turned out till the grass has a good start. A moderate mess should be fed as soon in July or August as the cows begin to shrink, either on account of dryness or insufficiency of pasture. As the season advances, and the value of the milk increases, both the richness and quantity of the mess should be increased, Of course, as long as the pastures are sufficiently succulent and plentiful to prevent shrinkage of milk, messing is unnecessary. But this is not generally the case after the middle or last of July, and almost never when the farmer has as many cows as it is profitable for him to keep. I recommend for July and August the feeding of bran alone, and later on a mixture of bran and middlings, or a mixture of bran and ground corn and oats. As to whether it will pay to mess cows in the Fall that are poor milkers, there may be some doubt; but there is no doubt about the profitableness of liberal Fall feeding with a dairy of good cows, such as every farmer should have. This is a fact that I have settled by actual experiment myself beyond all question, and also by the testimony of scores of the patrons of our various factories. To give you an illustration of the character of the testimony upon which I rely, in so confidently asserting this fact, I will copy from the books of Horr, Warner & Co., the milk accounts of two patrons for the past season. The first dairy, that of Messrs. Nooney & Phelon was messed during the latter part of the season; being fed, all told, about $125 worth of bran. The other, Mr. ——'s, had a good fair range of pasture, but were given no other feed. Both dairies had, in the latter part of the season, the same range of pasture that they had in the early part, with about the same amount of meadow in addition. In neither were milked any more cows in the late months than in the early ones :

	Nooney & Phelon.		*Mr. ——'s.*	
	Pounds.		*Pounds.*	
April	12,638		13,312	
May	17,564		20,599	
June	19,807		22,369	
July	20,244		19,310	
		Value.		*Value.*
August	15,794	$165 83	14,539	$152 65
September	15,572	194 65	13,099	163 73
October	15,958	223 41	9,028	126 38
November	13,553	216 52	4,953	79 24

Taking the June milk furnished by both as the basis of our calculation, by careful computation you readily ascertain that by Mr. ——'s dairy not doing as well proportionally in the last four months as it did in June, he has lost as follows : August, $34.64 ; September, $56.09 ; October, $125.91 ; November, $165.28. Total, $381.92.

Deducting the $125 paid by Messrs. Nooney & Phelon for feed, you have $256.92 as the amount lost by Mr. —— by not messing his cows. However, I am informed by Messrs. Nooney & Phelon that their December milk netted them enough to fully pay their feed bill, while Mr. ——'s

cows were nearly dry before the end of November. The cows of the latter are to-day worth $5 a head less than they would be had they been as well fed as the other dairy. Taking everything into account, then, is it not fair to say that Mr. —— loses fully $393 by not feeding. I will remark that in figuring the problem whether it pays to mess cows or not, dairymen usually leave out several important factors, among which are the following :

1. Less pasture will be required to keep a dairy that is messed than one that is not ; that is, if you keep twenty-five cows during the Fall in good flesh, relying upon your pastures alone for feed, you could surely keep thirty-two, equally well, by feeding say six or eight pounds of bran to the cow per day.

By pursuing the latter course you would get a much larger yield to the cow than if you kept a less number and gave no mess.

2. Your cows will enter the Winter in much better heart and flesh, if generously messed, than if not messed at all. Indeed, dairymen have repeatedly told me in the past month, that their cows are worth $10 a head more than they would have been if they had relied upon their pastures alone during the Fall. Besides, by keeping a few more cows on your farm, and regularly buying enough feed, together with what your farm produces, to give them a generous diet, you would be constantly enriching your land. This, in the long run, is a matter of no small importance. I maintain that you can stable cows the year round, buy all their feed, and produce milk profitably at a dollar a hundred, provided :

1st. That you keep none but first-class milkers.

2d. That you buy your feed at times of the year when it can be purchased at best advantage.

3d. That you select the kind of feed judiciously.

4th. That your cows are handled and milked with the utmost attainable care and skill. I have now on my place three cows that cost me an average of $55 a head. These cows, if allowed to go farrow, milked and cared for in above manner, would surely give, in twelve months, $360 worth of milk. These are not blooded cows. I know of a number of dairies of thirty cows each, that, managed as indicated above, would surely yield $3,000 worth of milk in a year.

The object of this paper is to stimulate dairymen to put more life, more thought, more energy, and more enterprise into their business. Competion compels factorymen to do their very best in handling the milk after it is delivered to them. Darwin's law of the survival of the fittest certainly holds good with cheese-makers and factories, whether it does in the animal kingdom or not. It would be better for the dairy interests if the same law applied with equal force to farmers. No man has a moral right to waste either God's blessing or his own opportunities. It is a moral crime to produce only $5 worth of milk to a cleared acre of land, when it is quite possible to produce $10 worth. It is an outrage against

intelligence to milk a cow year after year that gives only $30 worth of milk per year, when *some* can be found that will give three times that, *more* that will give twice, and very many that will give $50 worth. God intended a cow that gives only 3,000 pounds of milk in a season for the butcher's shambles, and not for the milking-yard ; and He intended the farmer who will continue to keep such a cow, year after year, for a milker of goats in some benighted land, and not for a milker of cows in this enlightened country and age.

Dairymen of Ohio and of the United States, you have great reason to be thankful for your prosperity during the past three years of financial storms and disasters. Cheese and butter, during all this time, have found ready sale at remunerative prices. The oft-feared danger of over production still remains an unfulfilled prophecy. You have been especially favored by fortune, and have been able to clear your farms from debts, and beautify them with improvements, while many of your fellow countrymen, engaged in other avocations, have, by depreciation of values and prostration of business, been reduced to poverty and bankruptcy. If you would retain this prosperity, you must deserve it. Those of you who have lacked in thoroughness must wake up from your Rip Van Winkle sleep, dig out the stumps, and cut down the straggling trees that mar your pastures and greatly lessen their growth of grass; ditch or underdrain all your low and swaley ground; plow deeper, cultivate more thoroughly, and seed down with more care; break up your hide-bound meadows; kill the weeds, thistles and briars, and grub out the shrubs and clear up the underbrush that deface the beauty and destroy the productiveness of your fields; save, utilize and conserve better both the solid and liquid manure of your barns and barnyards; buy cows, and only those that are first-class milkers; sell your inferior ones to the butchers, and, if you can't sell them, give them away to your brother-in-law; winter your herds in warm barns, with generous feed; have your cows kindly, quickly, carefully milked, and by the same hands during the entire season; feed them so well in the Fall that your November milk will bring you more money than your June or September. Do all this, and, if there should be a decline of 20 per cent. in the value of butter and cheese, your prosperity will continue. There are great possibilities yet undeveloped in your business; achieve them. There is too often a mean rivalry between cheese factories; let there be a generous one among dairymen. At the end of each season compare results with your townsmen, and let the golden medal be given to him who has produced the most milk to the acre, with the least expense for feed; and the silver medal be given to him who has produced the highest average to the cow.

Permit me, in conclusion, to suggest for the benefit of any one who may think it impossible to accomplish all that has been recommended, the following sentiment uttered by Goethe: "Energy will do anything

that can be done in this world; and no intellect, no circumstances, no opportunities, will make a two-legged animal a man without it."

Discussion on Mr. Horr's address.

Mr. H. FARRINGTON, Canada: I would ask Mr. Horr if dairymen take his advice and sell or give away their poor cows, how or when are we to get good ones ?

Mr. HORR: When you find a man that wants to sell, compare their milking capabilities by using the milk-pail and steelyards.

Many don't know the value of their best cows. When you find a really good one, get them to put a price on her, and buy her at almost any price, and you will buy cheap.

Mr. FARRINGTON: We are required to do to our neighbor as we would wish to be done by. I don't see how we all could do that and supply our dairies with good cows by following Mr. Horr's plan. Much might be done, however, if dairymen would carefully breed from the best milkers.

Most breeders breed for beef, scarcely any for dairy purposes. The only way for all to obtain proper cows for the dairy is to breed from the best milkers, without regard to blooded stock.

On motion, the Convention adjourned till ten o'clock next morning.

Third Day.

Thursday morning's Session.

The Convention resumed at 10 A. M.

R. P. Cannon in the chair, who announced that Mr. Farrington, Pa., would now continue his subject of "Full Cream Cheese," and give the Cheddar process.

Mr. FARRINGTON: First, then, we take the milk, set it, cut, heat, and manipulate up to a certain point, just as any other kind of cheese. As soon as the curd is sufficiently solid, or matured, so as to run together and pack, when the cheddar system is carried out in its fulness, the whey is entirely run off from the vat; immediately all that can be taken off with the syphon is first done; then the balance is removed by tipping the vat and packing the curd at one side, draining off the whey by taking a large strainer and holding up the curd to one side. One object of running off the whey is to remove any defects of the milk, animal odor, or anything that has developed while carrying to the factory. If you have milk somewhat badly tainted, you may still have a fair cheese.

The curd remains fresh all the time, while the whey is taking on an acid. I am not sufficiently scientific to know whether the curds sour or not. If it is likely to show too much sourness in the early stage, that condition is removed with the whey.

The more compact the curd is kept at the side of the vat, the warmer it will keep. I have practiced keeping a small stream of steam running under it to keep it warm.

When the top gets cool, divide the curd in parts of convenient size to turn without breaking, and turn it over as you would a pancake, so that all parts will be affected alike. This is repeated as often as necessary, at intervals of twenty or thirty minutes, until it is advanced to the proper stage for salting and pressing. This stage is determined by the appearance and smell. It becomes tough and stringy when pulled apart; then there is a peculiar odor attached to it at this time, and in fact it is inseparable. This odor is difficult to describe. It is a combination of odors, like the perspiration of the cow, or decayed animal matter—sickening like. When sufficiently advanced, it is run through the curd mill, and for this purpose I prefer those that cut into smooth pieces, rather than tear or bruise. It will not require as much salt as that which is not cheddared, from the fact that much more moisture is expelled. From 2¼ to 2½ pounds of salt to the 1,000 pounds of milk will be sufficient. When removed from the press it should be kept in a uniform temperature till it goes to market. In my observations in Canada, Pennsylvania, New York, and this State, I find that some practically cheddar, though they think they do not. When dairymen become convinced that the cheddaring principle is the correct one, it will no doubt become the practice of all. The best cheese at the Centennial was Cheddar cheese, and competent judges tell me that Cheddar cheese invariably takes the preference. I don't mean to say that because a man cheddars he will always make a good cheese; but it requires less skill to make good Cheddar cheese than it does to make good American cheese. This system is being adopted by a good many in Canada, and Canada cheese is certainly taking the preference in England. Their dealers tell us that Canada cheese possesses longer keeping qualities.

A few weeks ago a Syracuse paper advocated the making of cheese without acid. Prof. Arnold and others say that we don't want a bit of acid.

I am ready to adopt this idea thoroughly. I believe it is sound, practically correct, and useful to all of us. It is also said that cheese making is not one of the exact sciences. If you want to make a plow, a mowing machine, etc., you go to work and make each part in the same way, and you will make the machine every time. In cheese making, however, you cannot say that the milk should always be heated to just such a temperature, run off the whey in so long a time, etc. If it were worked in one way invariably, you would have just as many different kinds of cheese as there are days in the season.

The whole theory and practice depends upon chemical processes—chemical action.

You must take all these circumstances into consideration, and aim at nothing short of making the best article that is attainable. In regard to skimming, I will say a few words.

Those factories that expect to possess and retain the name of making first-class cheese, will no more take to skimming than one of you would pass counterfeit money. There appears to be very little difference in the amount of cream that goes over, whether it is skimmed or not. There is a peculiarity that I have never been able to explain. In making partially skimmed cheese there is still a certain amount of cream that passes off in the whey.

I am acquainted with such a factory, where there is invariably more cream on its whey vat than on those of whole milk makers.

It is a much nicer point to determine the amount of heat, rennet, the length of time required for the changes to take place, etc., in making skimmed cheese.

There was no inducement to make a prime article when your neighbor could realize as much as you. A different practice has been adopted the passed season. Pennsylvania cheese has been quoted at extreme New York prices. Mr. Reall will tell you that Pennsylvania cheese took the second and third prizes at the Chicago Fair. Ten cheeses, made in ten days, received the second premium.

Mr. J. H. Reall, of New York, offered the following resolution, which was adopted:

Resolved, That a committee of eleven be appointed to organize a National Dairy Fair, to be held at some central point during the present year; that said committee shall have full power to select place, raise funds, pay premiums, and make all arrangements necessary to the largest success of the undertaking; that said committee shall adopt rules for its government, and have power to fill vacancies in its own members.

Mr. Frank Moulton said:

Gentlemen and Members of the Association,—

I am glad that this matter has been brought up at this stage of the proceedings. I have just been conversing with a merchant from New York City, who has been an attentive listener through all the sessions of this convention. He said that if a Dairy Convention is held in the City of New York, he will give one hundred dollars toward defraying the expenses. Now, I want to say a word in regard to this committee and its appointment. It commends itself to my reason as well as to my feelings. Coming, as it does, from such a convention as this, it carries no uncertain meaning or emphasis. I am a new hand at these dairy conventions, although I have had something to do with other conventions. But this convention, it seems to me, transcends them all in the spirit which actuates those who govern and present their ideas to it. There is a spirit manifested, and an intellectual power exhibited, that commends itself to our highest admiration. When such men as Mr. Curtis, Professor Arnold, Professor Stewart, and many others (I do not wish to make any invidious distinctions)—when we see such men as these giving their time and talents to the discussions of this convention, certainly more than

ordinary importance ought to be attached to the appointment of this committee.

The committees generally appointed by your dairy conventions have had a professional and literary significance, on account of the character of the men who have given direction to your convention, but their business significance has generally not been valued, for no effort commensurate with the importance of the interests represented have been made to impress the business community. I hold that every effort should be made, now and henceforth, to make upon the business community that impression justly due to the extraordinary commercial values of the ideas enumerated and the practical thoughts suggested. The idea of circulating only 500 copies of Prof. Arnold's report of the proceedings, considering its value and importance to the country, is preposterous. A very little effort will circulate 5,000, and if proper effort is made in the representation of the business interests involved, 10,000 could be circulated with the greatest advantage. New York is the proper place to hold the American Dairy Fair to secure for it that continental and world-wide significance that should attach to the industry it represents.

Your committee should not come with distrust to the work before it. Its importance is worthy of the utmost attention which the best merchants of the country can give to it. Your influence should not be like the murmuring brook over a meadow, but flow with the rush of a river, and make an ocean that should wash all the shores of the world.

In conformity with the above resolution, C. Horr, Hon. Harris Lewis, and J. H. Reall were appointed to nominate the committee.

SELECTION AND BREEDING OF DAIRY CATTLE.

The President announced this as the next subject, and introduced Mr. Cornelius Baldwin, of Nelson, Ohio, who addressed the convention as follows:

Mr. President and Gentlemen: The question of selecting and breeding dairy cattle is a very important one, and yet no subject has been more neglected. How much more time and money has been spent to improve the breed of animals comparatively worthless. Look at the success that has attended the labors of dog breeders. With what uniformity is produced each succeeding generation of the different breeds, such as the greyhound, foxhound, coach-dog, etc. The same remark may be made with reference to the success of poultry breeders, and also breeders of beef for the shambles. But where will you find a breed of dairy cattle in which the milking qualities are so well established that you can, by resorting to it, get a desirable animal without being a judge of milking qualities. The most that can be said of any of the different breeds is, that in the one you will find a larger percentage of good milkers, or a smaller percentage of poor ones, than another. I believe a larger percentage of good dairy cattle will be found among the Ayrshires. For butter making the percentage will be found in favor of the Jerseys. The Holstein will

average probably equal to the Ayrshire in quantity. Among the Devonshire and Herefordshires, the percentage of good ones is small. The situation and climate must be considered in making a choice of any breed. If the farmer lives in a comparatively cold climate, he will not select from the Shorthorns. If situated in a warm climate, on river bottoms or level lands, Shorthorns and Holsteins would suit. It would be very difficult to find good dairy cattle among Herefords, although they are fine for beef. There are certain marks or indications, points or principles, some 45 or 50 in all, which may be noticed, and when these points are always the same, when they have that fixity of character, they are thoroughbreds, and under favorable circumstances they will be reproduced. There are about forty-five different points noticeable in dairy cattle, which are more or less indicative of value. A portion of them I regard as infallible, others more doubtful. To illustrate: Dairy cattle usually have dishing faces, but sometimes we find others have the same form, but are not good milkers. They have a certain symmetry of form, a wedge shape; but sometimes inferior ones have this shape.

In order that the animal may be termed a thoroughbred, she must carry all the points, having that fixed character, which indicates that she will certainly reproduce her own good qualities.

If we are looking only for the quantity of milk, then we need not take into consideration all the points. The milk veins are always an infallible indication. Now I insist that these points in all superior dairy cattle are the same, of whatever breed they may be.

The property of fleetness is exactly the same, whether we see it in a greyhound or in a horse

I will briefly enumerate these points, making use of these illustrations, which are copies of photographs of superior and inferior animals, so that when I describe a desirable point in the one you will see the reverse in the other. This one, No. —, produced 64 pounds of milk per day in the best of the season; has averaged that for some days. This one, No. —, produced 58 pounds. She was not fed quite as well as the other.

This one, No. —, produced 18 pounds a day. We will begin at the head, which should be short and small, and the bones throughout the frame will correspond, as dairy cattle are always fine boned. The head is rather long from the eye downward; lips and mouth thick and strong, and broader sideways, giving the muzzle a somewhat flattened appearance, as you stand in front of the animal.

From the horns to the nose it should have a concave shape. A Roman nose is not a good point.

From one eye to the other it should be concave or dishing.

This poor one you see is the reverse. The eyes should be large, showing considerable white in the inner corner.

The horns should have an upward and forward direction, and not too deeply corrugated with rings; in fact, the rings sometimes are not very

distinguishable in the best of cows. The horns should also have a waxy appearance; not too dry. The head is neatly joined, with no loose skin hanging, little or no dewlap under the neck, the neck having a rather short and neat appearance. The shoulders are generally lower than the hips, and rather thin at the top, with good breadth at the bottom, indicating room for the vital organs, and vigorous constitution. The ribs somewhat flattened rather than spread out.

Good dairy cattle are nearly always low sided and saddle backed. The hips are higher than the shoulders, the cow being generally wedge shaped, whether you take a side view or from top to bottom. Another peculiarity of dairy cattle is that they nearly always carry light flanks, as you will see in the Jerseys and Ayeshires. The udder may be of a variety of shapes, and still be good; usually in good milkers it hangs pretty low. The hind legs of dairy cattle are generally more crooked. The tail is long and tapering down to the brush, where it should be small. These points which I have mentioned are variable and have exceptions.

The other class, which are considered as reliable, and to which I shall now call your attention, consist of, first, the escutcheon or milk mirror; second, lacteal or milk veins, and, third, or next in importance, is the chine; and to this last I will first direct your attention.

This consists in the peculiarity of the vertical column, which you will notice on the top of what is usually called the backbone. This is either single or double. When double, it is thickened or widened by a sort of cartilaginous growth, and will feel as wide as the thickest part of your wrist.

A cow possessing a double chine is sure to be a good one, though not necessarily remarkable. She may be a good cow and possess the single chine; but in that case you will find what are called cups, or hollows, along the vertebræ, very distinctly, unless she is very fleshy, when they may not be very easily found.

Next, the milk veins, observed in front of the udder, after passing through it, pass along the belly and enter the body through one or more holes on their way to the heart. If these veins are large, divided, and crooked and tortuous, increasing in size as they extend, you will have a remarkable cow. Sometimes they are covered with a thick coat of hair or flesh, in which case they cannot be so easily seen.

In regard to the veins on the udder, they are very different in different animals. The larger and more numerous they are and more distinctly seen, the better.

The escutcheon, or milk mirror, was discovered by a Frenchman in 1831. There has been a great deal of controversy about it; and while all consider it of more or less importance, I am one of those who believe it to be strictly reliable. It is that portion of the rear part of the animal between the thighs on which the hair is growing upward or reversed. If the space occupied by this upturned hair is large and broad, so as to

extend outward on the thighs, it indicates a large flow of milk. There is also a front mirror, like the rear. Whenever you find a front mirror, you will always find a rear to correspond.

If the upper part of the rear mirror is broad and smooth, it indicates a prolonged flow of milk as maternity approaches. You can also judge of the quality of the milk. When there is a sort of greasy dandruff on the back part of the udder and between the thighs, this indicates richness of milk. The whole mirror should be as free as possible from coarse hair.

Ques. Can we judge of the prospective value of a heifer calf?

Mr. BALDWIN: It is the best time as soon as the calf is born, before it is dry, and the same remark applies to the bull, the double chine, the mirror, the lacteal veins—all those points should be carefully scrutinized.

Mr. W. B. STRAIGHT being called upon by the President, spoke as follows:

MR. PRESIDENT AND GENTLEMEN: As I came from the city about twelve years ago, my attention has not been given to these subjects for any great length of time, and what little I shall say may be considered as mere theory. In regard to where to get this dairy stock, my opinion is that the best way, and the surest way, although it may not be the least expensive, is to raise heifer calves, retaining only such as possess dairy qualities. In this way to keep up our dairies, and to supply those who wish to purchase. A year ago I employed a gentleman, a good judge of cattle, to purchase sixteen first-class cows, giving him the money, and telling him not to be particular about the price. Out of those sixteen which he selected, I think there are ten or eleven that it will pay to keep. I think it depends vastly upon the feeding also, as Mr. Horr has so well shown. In regard to the soiling system, I am satisfied it would be a great advantage to a large portion of our farmers were it practiced by them. I tried it to some extent last year, and was so thoroughly satisfied that it does pay, that I shall go into it more fully. With my comparatively short experience, I am fully convinced of the importance of underdraining, manuring, and thorough cultivation.

The committee appointed to nominate a committee of eleven to organize an American Dairy Fair, submitted the following names: T. D. Curtis, Syracuse, N. Y.; Francis D. Moulton, New York; T. G. Alvord, Syracuse, N. Y.; Harvey Farrington, Norwich, Ont.; Hiram Smith, Sheboygan Falls, Wis.; Geo. E. Gooch, Chicago, Ill.; R. P. Cannon, Aurora, Ohio; W. E. Smith, New York; A. M. Fuller, President Pennsylvania Dairymen's Association, Meadville; D. H. Burrell, Little Falls, N. Y.

RESOLUTIONS OF THANKS.

The following, introduced by Mr. Reall, was adopted:

Resolved, That the thanks of this Convention be and are hereby tendered to the newspapers of Cleveland, and to all the journals represented, for

their full and comple reports of each day's proceedings. Especially are we indebted to the press representatives who have prepared the matter for publication for their pains-taking labor and accuracy.

Resolved. That we tender to the officers of the Convention our thanks for their labors which have made the meetings successful, entertaining and instructive.

Resolved, That we hereby desire to express our very high appreciation of Professor L. B. Arnold's services to the dairy industries of America and of his earnest labors in promoting the interests of the American Dairymen's Association.

Resolved, That we wish him God-speed in his efforts, and bespeak for him a large measure of future usefulness.

At the conclusion of the adoption of these resolutions the Convention adjourned for dinner.

Afternoon Session.

The afternoon session was opened at 2 o'clock, Mr. T. D. Curtis, of Utica, occupying the chair.

The President announced that as Mr. J. S. Van Duser, who was to give an address on "The Refuse of the Dairy," was not able to be present, he had sent a substitute with his paper, which would now be read. He then introduced Prof. W. R. Lazenby, of Cornell University, who read the address, which is placed in connection with the discussions on the refuse of the dairy.

At the close of the address, the reports of committees were called for, and a special committee made the following report:

The committee appointed to consider the proposition to unite the Ohio and Western Reserve Dairymen's Association have had the same under consideration, and beg leave to submit the following report:

Your committee, after full consideration of the subject, is of the opinion that in a territory of the extent of the Reserve, where most of the dairy interests of Ohio lie, the best interest of said dairy farming can be better served by the formation of one principal society, with the recommendation that auxiliary societies be organized in each town through farmers' clubs, the grange, or such other organizations as localities may choose; said auxiliaries to hold frequent meetings as they may determine, and meet to form central societies in an annual meeting.

That the officers of the central organization shall consist of a president and four vice-presidents, a secretary, corresponding secretary, and treasurer. That the president and vice-presidents shall constitute an executive committee of said society, who shall decide time and place of holding meetings, fill vacancies in offices, and take the general management of all the affairs of the society.

That we recommend that the central association be known by the name of the Northern Ohio Dairymen's Association.

We recommend as officers of said association for 1878 the following gentlemen:

President—Hon. S. S. Warner, Lorain County.

Vice-Presidents—C. B. Chamberlain, Medina; J. B. Weir, Ashtabula; A. S. Beecher, Portage; W. B. Straight, Summit.

Secretary—John Gould, Aurora, Portage County.

Corresponding Secretary—M. E. Williams, Cleveland.

Treasurer—W. W. Stevens, Portage County.

Upon motion, the report was received and adopted.

Mr. LEWIS ; I would suggest to our friends of Ohio, in connection with their State association, the establishing of county associations. In St. Lawrence County, N. Y., we organized a County Dairymen's Association, which holds monthly meetings in different parts of the county. By this means information is carried to the very doors of the patrons, and great good can be accomplished.

Prof. ARNOLD : I submit a resolution to amend article 3d of the articles of association, by inserting the word "first" before "Vice-Presidents," and dropping the final "s" from the word "Presidents," so that the article as amended shall read as follows : The President, First Vice-President, Secretary and Treasurer, shall constitute the Executive Board of the Association.

The resolution was adopted.

The report of the Committee on Nominations was received and adopted, as follows :

President—Hon. Horatio Seymour.

Secretary—Professor L. B. Arnold.

Treasurer—Hon. Harris Lewis.

Vice-Presidents—Charles Horr, R. P. Cannon, M. B. Bateham, W. B. Straight, Ohio ; S. A. Farrington, A. M. Fuller, Eastburn Reeder, Pennsylvania ; C. E. Chadwick, Ingersoll, Ontario ; Thos. Ballantyne, M. P. P. Stratford, Benjamin Hopkins, E. Casewell, Ontario ; X. A. Willard, T. D. Curtis, M. Folsom, G. B. Weeks, Professor E. W. Stewart, Dr. E. G. Crafts, W. L. Rutherford, William A. Johnson, C. L. Sheldon, J. B. Lewis, Madison Cooper, Dr. L. L. Wight, Captain H. D. Gardiner, O. C. Blodgett, David H. Burrell, J. M. Peters, J. H. Reall, New York ; O. S. Bliss, Vermont ; Stephen Favile, Hiram Smith, Chester Hazen, Wisconsin ; I. Boise, Illinois ; C. F. Whitten, Minnesota ; J. T. Ellsworth and Professor L. Wetherell, Massachusetts ; Edward Norton, Connecticut ; John Stewart, Iowa ; P. H. Burchard, Illinois, and E. J. Wickson, California.

The agent of D. A. Healy, of Syracuse, N. Y., exhibited samples of air-tight tubs for packing butter, which were examined and approved, with some suggestions for an improvement in strength of hoop for top of tub.

Ques. What is the best timber for butter-tubs?

Mr. LEWIS: We have found white oak to give the best satisfaction and spruce, we think, the next best.

Prof. ARNOLD: There is no timber like white oak for butter. It has very little sap, imparts no unpleasant flavor, and in the third place the grain is tighter than any other wood. These three reasons make it one of the least objectionable for packing purposes. If the tub is properly prepared you may use ash or almost any timber. First soak them in cold brine; then in boiling hot brine. You will thus soak out all the flavor of the wood. I have heated butter-firkins with steam, inserting a rubber hose through a hole in one end of the firkin and connecting it with the boiler. The hot steam being turned in, the wood will swell and the steam will push its way through the joints and pores. By letting it stand fifteen minutes the sap will all be taken out. But that don't do everything. You want to fill the pores so full of salt that the air cannot penetrate through and act on the butter next to the wood. But by soaking them in boiling brine they become effectually saturated and impervious to air. A gentleman of my acquaintance packed some in tubs thus prepared in 1873, and kept it till 1875, when it was good and sweet, and that at the edge of the firkin was as sweet as it was anywhere.

Ques. How does basswood do for covers?

Prof. ARNOLD: Almost anything else is better. It imparts a disagreeable smell to the butter in a very short time, and shrinks and swells too much. Oak is as good as anything. Maple is very good. In Tompkins County there is a large factory in which maple is used altogether.

The Committee on Finance reported that they had no financial report to make.

The Committee on Dairy Apparatus made a report, recommending certain machinery and apparatus to the convention, as follows:

We have examined the following dairy implements on exhibition, and find that—

Hannan & Obits exhibit a self-heating vat, which we recommend as simple, effectual and economical.

Reed's Improved Steam Boiler seems to be economical of fuel and easily cleaned and repaired. It is novel in its construction and worthy of examination.

Guston's Butter Package, exhibited by S. M. Guston, Mexico, N. Y.; neat, light, handsome and serviceable.

E. L. Church, Harvard, Ill., Hay Elevator and Carrier; simple and cheap, and worthy of examination and trial, and is offered on very low terms.

Allison's Patent Tub, Syracuse, N. Y., exhibited by A. D. Ayres & Co., is sightly, and is claimed to be perfectly air-tight.

Whitman & Burrell, Little Falls, N. Y., exhibit a Curd Mill, which is, simple and easy to operate, cutting the curd instead of mashing or

bruising it. A good curd mill we consider essential in every factory, and is becoming decidedly popular among the best cheese-makers; also a very fine sample of Bavarian Rennets, at bed-rock prices; a fine sample of Annatoine; a vat with a cooler in it, which seems to do the work simply and effectually, and a superior Curd Knife, combining lightness and strength.

ALEX. MCADAM,
S. A. FARRINGTON.
S. E. CARTER.

The convention then adjourned.